

The JOURNAL OF THE DEPARTMENT OF AGRICULTURE

WESTERN AUSTRALIA

OL. 8 (Third Series)

MAY - JUNE, 1959

No. 3

Published every second month by the Department of Agriculture, St. George's Terrace, Perth

The subscription rate (which includes postage) is 10s. per annum. Single copies 2s. each.

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Articles which appear in the "Journal" may be reprinted, provided that the "Journal" and the authors are acknowledged.

Issued by direction of
THE MINISTER FOR
AGRICULTURE.

COVER PICTURE

The Salmon Gum (*Eucalyptus salmonopholia*) is found over a large tract of country eastward of a line from Mullewa in the north, through Carnamah, Moora, Brookton and Wagin down to Gnowangerup. Its shining lanceolate leaves and yellowish-pink to almost white bark make it one of our most attractive wheatbelt trees, and its timber is extensively used for mining purposes. The tree attains a height of 75 ft.

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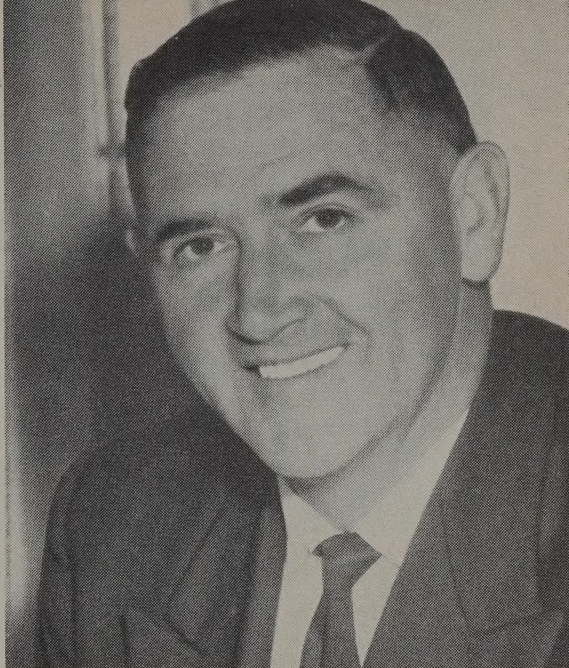
Government Botanist and Curator of State Herb-
arium.—C. A. GARDNER.

Farmer M.L.A.

Becomes

Minister for

Agriculture



Hon. C. D. Nalder, M.L.A.

A farmer and the son of a farmer, the recently-appointed Minister for Agriculture, the Hon. Crawford David Nalder, brings to his new post a wealth of experience gained in a lifetime of practical farming and stock-breeding; a knowledge of Parliamentary procedure dating back some 12 years and an understanding of rural matters gained as a member of the executive of farmers' organisations and as a member of the Wagin Road Board and the Wagin Agricultural Society.

Son of the late Mr. H. A. Nalder, a prominent breeder and exhibitor of Clydesdale horses in the pre-tractor era, the new Minister was born in Katanning in 1910 and remained on the home farm near Wagin until 1934 when he took over a 2,274-acre property, ten miles from Wagin on the Dongolocking Road. He maintains a Murray blood Merino stud on this location and has recently added to his holdings by the acquisition of a 700-acre property on which he has established studs of A.I.S. cattle, Suffolk sheep and Large White Pigs.

In 1947 he was elected as member for Wagin in the Legislative Assembly, in succession to the late Mr. Sydney Stubbs, M.L.A. The Wagin constituency was abolished in the 1948 re-distribution of seats and Mr. Nalder became the member for Katanning in 1950, and has since been returned unopposed for this electorate on three occasions.

As a successful exhibitor at agricultural shows he has played an important role in publicising the quality of the livestock produced in his electorate. At one time, he was the youngest member of the Wagin branch of the Primary Producers' Association, and later as vice-president of the branch he played a leading part in his district in bringing about the amalgamation of the P.P.A. and the Wheatgrowers' Union to form the Farmers' Union, of which he has been a member since its inception.

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Fig. 1.—A good stand of Bluebush on formerly salt-affected land at Kulin. An undercover of grass has also become established

BRINGING WHEATBELT SALT LAND BACK INTO PRODUCTION

By S. T. SMITH, Senior Soil Research Officer, and C. V. MALCOLM, Research Officer, Department of Agriculture.

INVESTIGATIONS carried out over many years on salt-affected land in the wheat-belt of Western Australia have shown that it is often possible to return salt land to productivity. This article suggests how this may be done.

Salt encroachment, to a greater or lesser degree, exists in many wheatbelt areas, in fact, in 1955, it was estimated that about one million acres were affected. While salt in the subsoil, either as free salt or dissolved in water is not particularly harmful to crops and pastures, it gives rise to problems when it accumulates at the surface of the soil. The task of bringing salt-affected land back into production is not an easy one, but the techniques outlined here have proved effective.

GENERAL SALT LAND TREATMENT

It has been shown that the main steps in reclaiming salt land are to maintain a roughened surface and to exercise careful grazing protection. The roughened surface breaks the surface seal thus allowing water to enter the soil. As the water passes downwards it washes the salt from

the surface. Seeds are able to germinate and plants can then become established provided adequate grazing protection is maintained.

In this way, mildly-affected land can be returned to its normal usage. It must be emphasised, however, that patience is required, and repeated workings over several years are often necessary before benefits begin to accrue. This approach is, therefore, quite useful on land where salt encroachment is not excessive, but can be disappointing when the land is very severely affected. Such land requires very long periods of almost annual cultivation and re-sowing to re-establish annual pastures and crops. For this reason, salt-tolerant perennial plants are favoured for the more severely salt-affected land. These salt-tolerant perennials, once established, do not require annual re-sowing and thus



Fig. 2.—These furrows were made by a nine-furrow mouldboard plough with only two shares operating. Seed of Bluebush has been trapped in the broken ground and plants are establishing on what was a bare salt flat

the expense of costly and repeated working is avoided. Furthermore, their root systems are usually deeper and extend below the level of very high salt concentration.

There are many salt tolerant perennials but in this article it is intended to discuss only Bluebush (*Kochia brevifolia*), Old Man Saltbush (*Atriplex nummularia*), and Creeping or Trailing Saltbush (*Atriplex semibaccata*). There are all well suited to the rather severely salt-affected land in the eastern wheatbelt where winter waterlogging is not severe. They are all extremely salt-tolerant and, managed properly, can be quite productive. Each of these plants will be discussed in turn.

BLUEBUSH

(*Kochia brevifolia*).

This plant occurs naturally in wide-spread situations in the wheatbelt. The bushes are a dark-green colour and, if allowed, grow to about 2 to 3 ft. in height. The leaves which are small and rounded are full of water which may readily be squeezed out even at the end of a long dry summer. Most growth occurs in the period from November to April and profuse flowering takes place within this period. The flowers, when mature, are very light

and papery and are widely scattered by wind. While this characteristic makes seed collection very difficult it also allows a very easy natural spread, provided suitable management is imposed. Bluebush has a very high feed value and contains more crude protein than subterranean clover. Values of 25 per cent. crude protein (on dry weight) have been recorded. It is eaten more readily in summer than winter but is always quite palatable. Its ability to recover from heavy grazing is astonishing and can possibly be partially attributed to its very deep root system.

Suitable Soil.

Bluebush is extremely salt-tolerant and can grow on some of the most severely affected soils in the eastern wheatbelt, provided they are not excessively waterlogged in the winter period. It appears particularly suited to our morrel soils but also grows quite well on most of the "heavy" or finely-textured soils. It readily colonises quite bare salt land.

Planting.

The seed of this plant is very small and shallow planting is essential. Unfortunately, fine seedbeds are not desirable on salty soils and probably the best way of achieving shallow planting on a rough



Fig. 3.—A furrow has trapped seeds of Bluebush and plants are well established where the ground was formerly bare

surface is to allow the seed to drop on to the freshly-cultivated roughened surface. However, any means of achieving shallow planting is reasonably successful. Planting should be done in the period May to July and the area should be completely protected from grazing for at least 12 months. It should be emphasised that, quite often, no young plants are visible until the following autumn, and one should not allow the area to be grazed on the assumption that planting was a failure. If the area is likely to receive excessive sand blasting, cereal rye should be sown in addition. Normally, however, young Bluebush plants establish better in the absence of competition from other grasses.

Bluebush can be sown at rates from a few ounces up to 2lb. or more per acre. Only a few Bluebush plants may result from a planting of this nature. However, because of its natural seed dispersal it will spread quite readily from a few parent plants. To enable this natural spread to proceed it is essential to do two things. Firstly, grazing exclusion is necessary until the stand of plants desired is achieved. Secondly, the bare, smooth salt-affected surface between the established bushes must be roughened with an implement such as a scarifier or chisel plough or furrowed with a single-furrow plough or ripper in order that seed may be trapped. One of the accompanying photographs illustrates the effect of this furrowing on the trapping and subsequent germination of Bluebush seed.

Seed Availability.

Unfortunately, seed of Bluebush is not easy to obtain. Hitherto it has not been on the market but recently a stock firm has indicated that it may have a very small quantity. However, it is quite possible within the flowering period of this plant (January to May) to collect seed sufficient for the establishment of a few parent plants. By placing a sack over the foliage of Bluebush and shaking vigorously, seed is dislodged into the bag. By this means a pound of seed may be collected in the matter of an hour or two. A pound of Bluebush seed gives a large number of potential plants but even if only a few establish these can be a source of seed which, by natural spread, can establish cover on a large area. The importance of grazing protection in this process is emphasised.

OLD MAN SALTBUUSH (*Atriplex nummularia*).

This is one of the largest of the salt-bushes sometimes growing up to 6 or 7 ft. in height and many feet across. The large leaves and stems have the characteristic whitish-green colour of saltbushes. Like Bluebush, most growth occurs in the warmer weather. The seeds are produced in the summer in huge bunches on the female bushes. While these seeds are ultimately dislodged they are not easily spread by wind and, as a result, natural seed dispersal is poor. Well-established bushes will produce a considerable bulk of

Fig. 4.—A planting of Old Man Saltbush on salt land at Korbél



palatable feed of about the same protein content as subterranean clover. Bushes can be heavily grazed for a short period provided ample time is allowed for recovery.

Suitable Soil Types.

In the eastern wheatbelt, Old Man Saltbush grows reasonably well on most soil types which are affected by salt encroachment. Old Man Saltbush does appear to stand a little more winter waterlogging than Bluebush although even so it does not like "wet feet" in the winter.

Establishment.

Old Man Saltbush can be established from seed, which, as in the case of Bluebush, must be planted at a very shallow depth. Planting should be done in the period May-July, preferably after the winter rains have arrived. Unfortunately, germination is extremely variable and good success in one year may be followed by almost complete failure the next year. Subject, however, to receiving a favourable season, it is possible to establish Old Man Saltbush plants on quite salty soil. Grazing protection is essential. Subsequent spread of seed is dependent upon manually scattering the seed which is easily stripped from the bushes.

Seed Availability.

Seed may be readily procured by stripping seed-laden bushes. By this means several pounds may be collected in a few

minutes. Seed may also be purchased from at least one of the local stock agents.

CREEPING OR TRAILING SALT BUSH (*Atriplex semibaccata*).

Creeping Saltbush grows with a creeping habit lying flat on the ground in a broad mat up to several feet in diameter and 3 to 6 in. in height. The leaves and stems are small and of the characteristic whitish-green colour of other saltbushes. Flowering in spring and summer the bushes produce an abundance of bright red succulent fruits which dry out to give dark red-brown seeds. Spreading of the seed occurs mainly by means of stock. The bushes, which are short-lived, normally die out after two years or so, but are replaced by new seedlings. Creeping Saltbush is extremely palatable and may be grazed out if adequate care is not exercised.

Suitable Soil Types.

Almost any saline soil in the wheatbelt will grow this plant satisfactorily although, as with bluebush and Old Man Saltbush, excessive winter waterlogging is undesirable.

Establishment.

This plant establishes very readily from seed which can be planted by normal planting methods in the period May-July, after the winter rains have arrived. Shallow planting is essential.

Seed Availability.

The seed of this plant has hitherto not been available as it is an extremely laborious process collecting seed by hand. However, in recent years one of the stock firms has been obtaining good supplies from South Africa. By sowing at the rate of a couple of pounds per acre it is usually possible to establish sufficient plants from which a further natural spread may take place on a very restricted grazing programme.

ESSENTIAL POINTS IN PERENNIAL ESTABLISHMENT

Although the establishment of these three perennials, Bluebush, Old Man Saltbush and Creeping Saltbush has been described it is worthwhile to emphasise two very important factors. Firstly, grazing protection is essential and sometimes it is desirable to exclude stock for up to three years in order to allow sufficient plants to establish a good cover. So often plantings appear to be a failure and stock are permitted to enter with the result that small plants barely visible are not permitted to survive. One cannot over-emphasise the importance of grazing restriction. Secondly, no matter how much seed of these plants is being spread by natural agencies they cannot establish unless they are retained on the area. In order to retain this seed it is essential that the area be roughened in some way. The use of scattered furrows up to 10 yds.

apart in a checker-board pattern is a satisfactory and economical way of achieving the roughening desired. Seeds will collect in the furrows and will germinate after the water has washed the salt downwards.

SUBSEQUENT MANAGEMENT OF SALT TOLERANT PERENNIALS

It has been indicated that the establishment of these perennials may take a few years and almost total grazing restriction may be desirable within this establishment period. Once, however, a good cover is obtained, the area may be grazed as much as possible subject to the plants not being eaten out. Bluebush will stand extremely heavy grazing but, unfortunately, this is not so with Old Man and Trailing Saltbushes.

The majority of growth of these plants occurs in the summer time. Grazing during spring and early summer will restrict growth and, if very severe, cause the death of bushes. Fortunately, the greatest demand for feed from these bushes occurs in late summer and in autumn, and the bushes may be grazed fairly heavily in this season without ill-effects.

Once the perennials are established, a grass cover will gradually develop among them. This is very desirable, as it is believed that stock require dry grass to eat in association with these rather high feed value green fodders.

HAND FEED YOUR IN-LAMB EWES

The importance of providing supplementary feed for ewes during the last six weeks of pregnancy was stressed by Mr. W. L. McGarry the Officer-in-Charge, Sheep and Wool Section of the Department of Agriculture.

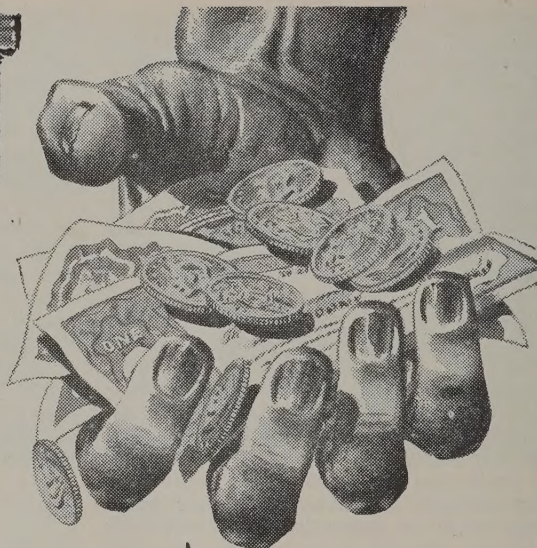
Six weeks before lambing is due to commence, the ewes should be given $\frac{1}{2}$ lb. of oats per head per day. If paddock feed is scanty, a hay ration should be given in addition. A fortnight later, the grain ration should be increased to $\frac{3}{4}$ lb. per ewe per day and after two weeks this should be increased to 1 lb. a day, and maintained at this level until the new season's feed has grown sufficiently to make hand-feeding unnecessary.

Mr. McGarry said, that although hand-feeding in the first three months of pregnancy did not appear to benefit ewes and lambs to any marked extent, it was most important that the ewes should be gaining in condition during the last six weeks.

Under-nourishment during this period led to the birth of small, weak lambs which had a poor chance of survival. Under-nourished ewes were slow in commencing lactation and their milk production was reduced causing them to show less concern for the welfare of their lambs.

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Subterranean clover established on deep sand in the Esperance district. A marked improvement was brought about in this soil by using inoculated seed. Both plots received 200 lb. super. without lime, but with copper and zinc. The seed in the right-hand plot was inoculated, that in the left-hand plot was not. Commercial seed was hand-sown in both plots and the super. was kept separate from the seed in the sowing operation.

GROWING SUBTERRANEAN CLOVER ON DEEP SANDS

By G. H. BURVILL, M.Ag.Sc., Chief Plant Research Officer

SUBTERRANEAN clover cannot be easily established on deep white sands, though it has been successful on many sandy and gravelly surfaced soils. Research in South Australia and Western Australia has shown ways of improving growth on deep sand. Recommendations for Western Australia are made at the end of this article.

Subterranean clover (*Trifolium subterraneum*) is the most important sown pasture plant on Western Australian farms. It is important too in South Australia and other Australian States. Since World War II several million acres have been planted with subterranean clover in Western Australia and South Australia, mostly on soils with coarse-textured sandy surfaces, often with ironstone gravel. These soils are of low natural fertility but commonly have clay subsoils within two feet of the surface. Subterranean clover pastures, given liberal dressings of superphosphate and the trace elements copper and zinc, and sometimes molybdenum, are the basis of improved grazing and of soil fertility build-up. An example from Esperance illustrates this. Oats (variety Avon) yielded almost 90 bushels per acre in 1958 at Esperance Plains Research Station on land which had been developed for seven years with subterranean clover pasture.

The oat yields in 1951 on new land fallowed, with super, copper and zinc were less than 10 bushels per acre.

Both in Western Australia and South Australia where subterranean clover is doing such a good job on many soils of low natural fertility, there are also areas of deep sandy soil. This white, or almost white, quartz sand goes down from two to over 20 ft. in some areas without reaching clay subsoil. Subterranean clover establishment on these very poor soils does not succeed when proved methods for other soils are used—for example, good land preparation, superphosphate, trace elements and seed inoculation are not sufficient on deep sands.

USE OF LIME

Research workers of the South Australian Department of Agriculture have used lime successfully on the deep sands of the lower south-east of their State. A 50-50

mixture of super and ground limestone is used at two bags (that is about 375 lb.) per acre. Copper, zinc and molybdenum are also added. Lucerne and *Phalaris tuberosa* are recommended for sowing with subterranean clover in the deep sand areas with 20 in. or more annual rainfall.

It has been found that mixing seed with a superphosphate-trace element mixture before sowing in deep sands greatly reduces the number of seedlings compared with mixing with the lime-fertiliser mixture. Lime-dusting or lime-pelleting the seed has not been effective in overcoming the problems. More recently it has been suggested that the seed and limestone-super could be mixed and drilled, and more super plus trace elements applied in a separate dressing to avoid seed contact.

Western Australian research workers have also worked on sub. clover problems on deep sand in the last few years. Such sands are common in the west coastal strip and from Albany to Esperance. Experiments are in progress at Muchea, Kojonup, Kent River (which is south of Rocky Gully), Narrikup, Gairdner River (below Jerramungup) and Esperance. These centres range from 20 to 35 in. rainfall. The deep sands are well drained, and before clearing carry scrub or tree banksias and other scrub, and sometimes stunted jarrah and coastal blackbutt. Humus darkens the top three inches of the soil which has a pH about 5.5. Various combinations of phosphate, lime, trace elements and seed inoculation have been tried, and so far results are not consistent at the various sites. **It must be emphasised immediately, too, that at no site has a really good stand of sub. clover been achieved.**

Lime drilled or broadcast, or in 50-50 mixtures with super, or basic super, has generally given some improvement. Copper and zinc have been used in the form of copper ore and zinc oxide, both of which are far less water-soluble than the copper sulphate and zinc sulphate generally used in South Australia. From general experience copper and zinc are believed to be essential additions on deep sands and they have been used in all trials.

C.S.I.R.O. experiments showed benefit from molybdenum on deep sands at Kojonup but Department of Agriculture trials at Muchea did not. Seed inocula-

tion caused a big improvement at Esperance and Gairdner River, but not at Narrikup, Kent River or Muchea. Urea and dried blood to supply about 10 lb. of nitrogen per acre improved early growth. The urea effects did not persist, but with dried blood the benefit continued late in the growing season.

Because the surface of deep sand dries so readily seed sown 1½ in. deep does better than if sown on the surface. But mixing seed and fertiliser has reduced germination and in some cases final growth. Fertiliser should be in the same row with seed but, if possible, separated from it by half an inch of sand.

Both in South Australia and Western Australia it is recognised that deep quartz sands must have very small reserves of other essential plant foods. Potassium is almost certain to become deficient if good clover growth is obtained from phosphate, lime and trace elements suitably applied. After the first year potash is almost sure to be needed as fertiliser. On deep sands in the West Swan area near Perth an improvement from potash was demonstrated on first-year subterranean clover.

Deep sands occurring on existing farms or in good rainfall areas present another challenge in agricultural research. The South Australian workers have achieved quite good results for their conditions. In Western Australia attempts to establish subterranean clover on large areas of deep sand are not encouraged at present. Work will continue, but it must be realised that with soils so poor, any practical success will be costly. It may be too that other species will prove better than subterranean clover.

For those who wish to try subterranean clover on deep sands the following recommendations are made:—

Sow 6 to 10 lb. per acre of inoculated good quality seed.

Plant 1 to 1½ in. deep in moist soil.

Use basic super, or 50-50 super and limestone, at 2 to 4 cwt. per acre. Copper and zinc should be included.

If possible, sow seed and fertiliser in bands near each other but aim to have about half an inch of sand separating them. If this cannot be done, mixing seed and fertiliser should give reasonable results.



Fig. 1.—Part of the trapping yard. A euro is being put into a bag for examination

PASTURE MANAGEMENT AND THE EURO PROBLEM IN THE NORTH-WEST

By E. H. M. EALEY, M.Sc., Wildlife Section C.S.I.R.O., and H. SUIJDENDORP, B.Sc. (Agric.), District Adviser, North-West Branch.

OVER the past 20 years sheep numbers in the North-West of Western Australia have suffered a marked decline. In the Pilbara area, six stations have been abandoned, and about a dozen more are in a precarious position. If these were to be abandoned also, some 10,000,000 acres of sheep country would be idle. It is now known that the shrinking flocks have been caused by a deterioration in the pasture vegetation, particularly the disappearance of the more nutritious native grasses on which breeding ewes depended to provide the high-protein diet required for the production and rearing of their lambs.

Poor seasons have often been cited as a contributing cause of the decline in stock numbers. In this connection it is interesting to note that in the Pilbara district a big decline took place between 1934 and 1946, and this coincided with the highest average rainfall period on record (see Table 1). Certainly the extremely low summer falls in the last ten years have made regeneration of the vegetation difficult and slow, even though stock numbers were at a very low level.

TABLE 1
AN ANALYSIS OF THE RAINFALL RECORDS FROM
WOODSTOCK, 1908-1957

	1908-17	1918-27	1928-37	1938-47	1948-57
Mean Summer	1,015	976	985	1,212	710
Mean Winter	347	176	248	206	278
Mean Annual	1,362	1,152	1,233	1,418	988

In the opinion of the local pastoralists, the main factor in the deterioration of the north-western country has been the grazing of euros which had built up to very



Fig. 2.—The watchtower from which continuous watches of up to a fortnight were kept to determine the drinking patterns of marked animals

high numbers as a result of the increased provision of stock waters. This was why the C.S.I.R.O. started its investigations in the Abydos-Woodstock area, with the object of assessing the importance of the euro as a competitor of the sheep and of indicating the best method of bringing them under control if this was found to be essential or desirable.

OVERSTOCKING TO BLAME

The evidence now available points to the fact that the prime cause of the deterioration of the North-West pastures has been a stocking policy that is unsuited to the climate and conditions, and not to the grazing of euros that have bred up following increased water supply. In areas where there has been abundant natural water for hundreds of years, pastures have degenerated under stocking in the same manner as where water has recently been provided. Moreover, experiments carried out in enclosures with kangaroo-proof fences have shown that stocking by sheep alone can quickly produce the pasture changes that have occurred in the region as a whole.

Evidence from the vermin-proofed grazing trials at Abydos indicates that continuous selective grazing at the rate of one

sheep to four acres will prevent all regeneration of pastures. On stony country such as Abydos, the better patches must have

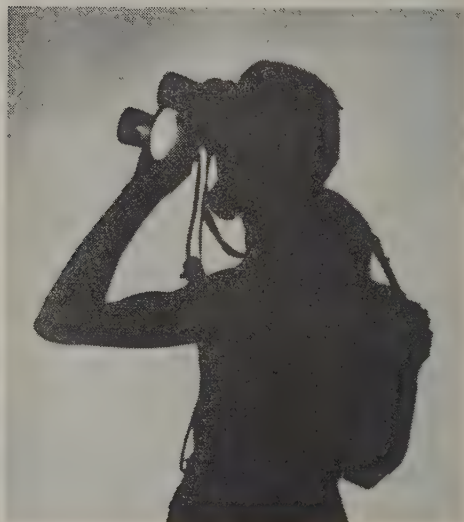


Fig. 3.—A research worker, silhouetted against the evening sky, identifies individual euros by the symbols on their collars. These are in reflector tape which gleams in the spotlight attached to the binoculars



Fig. 4.—A close-up of a euro, showing the collar and symbols which identify it. The collars are of yellow plastic and the symbols are in red "scotchlite"

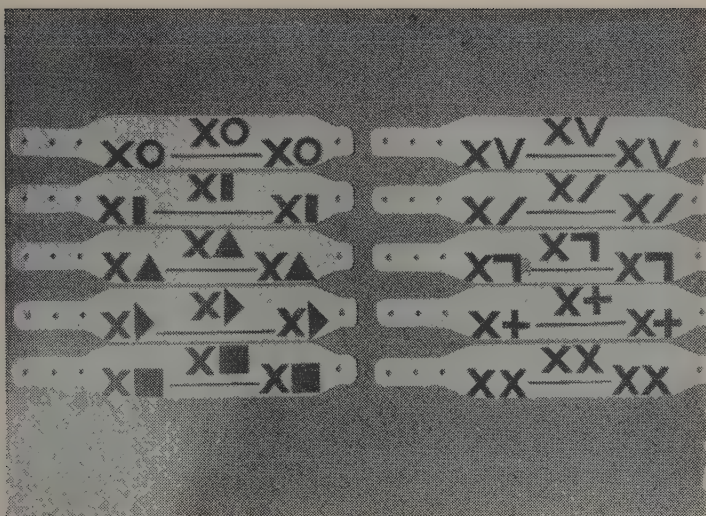


Fig. 5.—Plastic collars used for identifying euros. The animal which wore the collar marked "XX" has been seen 17 times in an area of less than a quarter-mile square

carried at least that number to average an overall stocking rate of one sheep to 18 acres. On first-year burns, it was found that one sheep to ten acres consumed all that was produced in the way of palatable forage in the first wet season leaving nothing to produce seed or carry on until the following year.

The time of burning of spinifex (*Triodia purpurascens*) determines the type of plant community that will emerge after the first rains. Burning at mustering time (April-May) combined with uncontrolled grazing encourages a speedy return of a pure stand of spinifex. Such a pasture will not be sufficiently nutritious to allow ewes to lactate.

Although it is clear that first attention should be paid to stock policy and stock management, an over-abundance of euros can certainly be expected to aggravate pasture degeneration caused by sheep and slow up the process of regeneration, and therefore action to reduce euro numbers will often be necessary. As water poisoning remains the most promising method of control special attention was paid in the C.S.I.R.O. investigations to the drinking habits of the euro.

WATERING HABITS

As is well known, euros start coming in to water—either to natural waters or drinking troughs—when conditions are dry

and beginning to get hot, usually some time in September or October; and as the summer advances they will come in to water in increasing numbers. Thunderstorms and cyclones may produce rain as early as November, which may continue intermittently until March. In exceptional years, rain may occur through the winter until August.

On Woodstock the creek beds provide the main natural watering places. Heavy rain causes the creeks to run for a few days, after which the water that has not flowed down to the sea sinks through the sand. Almost all the surface water in the creek beds has dried up by early summer, and the euros then have to dig down through the sand for two or three feet to obtain a drink. By mid-summer most of the water that can be reached in this way has dried up.

The general seasonal pattern of drinking was determined by attaching automatic counting devices to water points which provided a record of how many animals drank each night at different times of the year. The details of the euro's drinking habits were mainly worked out from observations made at one particular artificial watering place. This study involved the catching and marking of some hundreds of euros, which were provided with plastic collars bearing reflecting symbols. These enabled the animals to be individu-



Fig. 6.—A large buck euro can exceed 90 lb. in weight and is difficult to handle

ally recognised, by day or night, by observers stationed on a watchtower at the water point. These observers were equipped with a spotlight and high-power binoculars. The records that disclose the actual frequency of drinking were made during a period of continuous day-and-night watching carried out over a period of 17 days. It was important to know whether the marked animals under observation were getting drinks at other water-points nearby, so these were fitted with automatic dye-squirting devices that would mark the fur of any animal coming to drink at them.

The results of this investigation show that euros usually drink at the same place, although disturbance could cause some to move to water three or four miles away. More important, it was revealed that most euros did not drink very often, even when conditions were dry and temperatures were high. (By December, if rain has not fallen, most euros would be drinking fairly frequently although not every day.)

When it was realised that, even at the height of the North-West summer, euros did not come in to drink daily, with water conveniently available, the ability of the animals to cope with desiccation and water-shortage was looked into further. A group of euros was confined on a patch of typical spinifex country, with one small rock outcrop and no available water. Some of them survived the months of September, October and November without drinking.

In the physiology of the euro, water has two main uses, regulating the body temperature (which means cooling the body in summer) and the production of urine, in which the body's nitrogenous wastes are removed in solution. Observations indicate that euros are able to economise on water usage by (a) not moving during the heat of the day, (b) seeking shade in caves where temperatures may not exceed 90° F. despite outside air temperatures of 115° F., and (c) by reducing their food intake so that less waste products are produced in



Fig. 7.—Euros, dazzled by strong lights, are easy to catch at night time



Fig. 8.—Young female euro licking her fore-paws to cool herself



Fig. 9.—A euro leaving a "soak" where water could be obtained 2 ft. below the surface of the sand

the body needing to be washed away as urine. It is possible also that the species has developed as yet undetermined physiological adaptations to help it survive dehydration for long periods.

WATER POISONING IN PRACTICE

The results obtained in the experiments and observations just described emphasise two very important practical points. The first is that to get a worth-while percentage of the euros watering at any point, poisoning operations must be continued over several days. A minimum of six days is recommended. The second is that poisoning should only be attempted under hot, dry conditions, for it is only then that the whole local euro population will be watering with any frequency. Generally speaking, in the North-West, it is usually not worth while poisoning until December. November poisoning should not be attempted unless the month happens to be very hot and dry and has been preceded by an extended dry spell.

Although a single watering-point can be poisoned with good effect, to get the best and most lasting results it is recommended that all watering points on a substantial area—say 50,000 to 100,000 acres—should be poisoned in one drive.

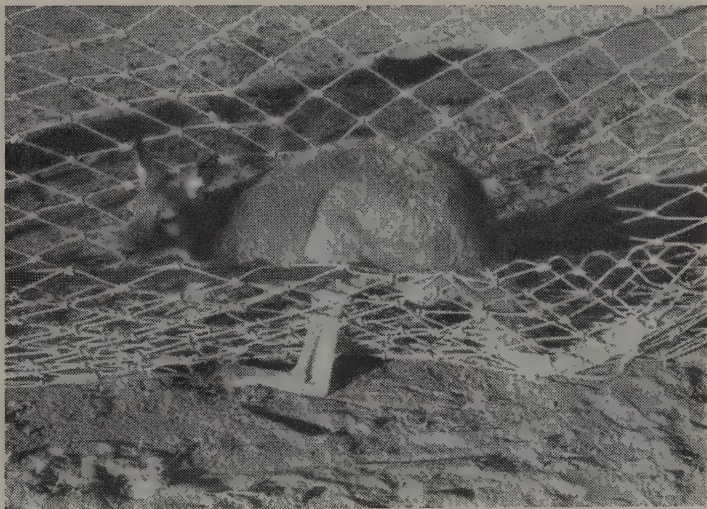
The normal stock-drinking troughs should be used, and care should be taken

not to leave strange objects about the water-points, as euros are liable to be frightened away by them, and might not return to drink for a week or more. The carcasses of poisoned animals should be removed from the neighbourhood of the water-points, especially from the pads and tracks leading into them. The concentrations of arsenical poisons given below make almost tasteless solutions, and will kill most animals some distance away from the troughs. If stronger solutions are used, animals will die closer in; and they may drink less because of the increased repellency—some animals may even be repelled at the first taste and refrain from drinking any more.

If the paddock in which poisoning is carried out is stocked, sheep can be excluded from the trough by a six-strand strained wire fence, which should preferably be a permanent fixture 25 yds. square, with gates to allow easy access of stock at other times. Wires should be checked for slackness each night when the gates are closed and the trough filled with the poisoned water.

The kill at a water point can be calculated on the basis that the average euro will drink $2\frac{3}{4}$ pints and the average plains kangaroo $3\frac{1}{2}$ pints. (Individual plains kangaroos may drink as much as 12 pints at a visit.)

Fig. 10.—A buck euro tangled in the netting of the trap



It is unnecessary to look beyond arsenicals for water poisoning, as they are readily available and known to be effective. The following are recommended at the concentrations given. The "tin" mentioned is a round, 2-oz. fine-cut tobacco tin which is a standard practical measure used on stations. It holds about 6 oz. by weight of sodium arsenite.

- (a) **Sodium Arsenite**— $1\frac{1}{2}$ tins or 8 oz. to 40 gallons of water. A solution of sodium arsenite can be purchased as a weedkiller under the name of Arzeen Liquid. If this is used—2 tins or 8 fluid oz. to 40 gallons of water is a sufficient dose but this solution can be tasted.

Soluble sodium arsenite can be prepared from the comparatively cheap but insoluble white arsenic (arsenic trioxide) and soda. 3 lb. washing soda plus 2 lb. white arsenic will produce enough soluble arsenic for 320 gallons of water. Alternatively 1 lb. caustic soda plus $2\frac{1}{2}$ lb. white arsenic produces enough soluble arsenic for 400 gallons of water. In making up the solutions the quantities given above *should be strictly adhered to*. The arsenic and soda should be boiled in about 4 gallons of water until dissolved and

the solution kept in airtight containers, preferably of glass or plastic, until broken down for use. If it is stored in 26 oz. bottles, 4 gallons will fill 24 bottles. Three bottles to 40 gallons of water will be required if washing soda is used and three bottles to 50 gallons if caustic soda is used.

- (b) **Arsenic Pentoxide**—2 tins to 40 gallons of water. Unless care is taken that all the powder goes into solution the poison will not be strong enough. (This can be purchased in proprietary form of "Feltons Kangaroo Poison.")

Water Softening.—Where the water is known or suspected to be hard, a water softener such as "Calgon" (Sodium Hexametaphosphate) must be used or the arsenic will come out of solution. It is never necessary to use more than 1 lb. "Calgon" to 350 gallons of water. This should be mixed into the water before adding the arsenic solution.

REINFESTATION OF A POISONED AREA

An area that has been effectively poisoned will be subject to reinfestation by euros either by immigration or as a result of the breeding-up of survivors.

It has always been suspected that, unlike the nomadic plains kangaroo, the euro



Fig. 11.—Technical assistant B. Harbers takes an instrument into a cave where euros sleep during the day. The cave is in a granite outcrop and temperatures below 90° F. were recorded there when outside temperatures exceeded 115° F.

is sedentary in its habits. Observations made during the course of the Woodstock investigations have confirmed this. Marked individuals have shown a strong tendency to remain within the same area, which may have a radius of less than one mile. The attraction which an established home range has to a euro has been demonstrated by the fact that marked animals removed from their normal beat will return to it, even from a distance of as much as ten miles. It seems safe to conclude, therefore, that reinfestation by immigration is unlikely to prove an important factor under normal conditions; and this is borne out by practical experience. Areas that have been effectively poisoned have not become rapidly reinfested, even though dense euro populations occurred within six miles.

The Woodstock investigations included observations on euro reproduction, and their results give some indication of the rate at which the population surviving in a poisoned area would build up as a result of breeding. Because of the length of the combined gestation period and the pouch life of the joey, an adult doe euro can normally only produce and rear one young one a year; and because a natural population will comprise rather less than one-half males and will also include old does whose fecundity is falling off and non-breeding juveniles (less than two years old) the maximum possible rate of increase will probably be nearer 30 than 40 per

cent. per annum. Such a rate of increase could, of course, rapidly nullify the effects of, at any rate, an inefficient poisoning. However, we know that in nature this theoretical maximum will rarely be attained, and even more rarely maintained over a run of years. Observations have shown that quite a high mortality must be expected in the pouch young, and that a high survival rate is only likely to occur in a season when the summer rains began early and were not followed by a dry winter.

When a really effective poisoning is carried out, reducing the euro population in the treated area by 80 per cent., the original numbers could be built up by breeding in six years—if they were all favourable. Such a continuous run of good seasons would be most unusual; and in practice a euro population would almost certainly need at least a decade to recover, by breeding, from the effect of a really efficient poisoning campaign. Where uncontrollable natural waters occur to reduce the efficiency of operations, more frequent poisonings will of course be required.

COMBINED PASTURE MANAGEMENT AND EURO CONTROL

The success of a deferred grazing technique in bringing about pasture regeneration has been demonstrated both in experimental plots and large-scale trials in

Fig. 12.—Automatic counter to record the number of euros which drank at a water-point. The treadle has had a board removed to show the counter



the North-West. Good results have been obtained even under conditions of heavy euro infestation, although no doubt they would have been even better with euros under control.

Muccan Station carries about 14,000 sheep and a population of kangaroos estimated to be considerably larger. The management programme of a flock of 3,000 wethers was changed in 1954, off-shears, from continuous grazing to a deferred rotation. Whereas before these sheep were scattered over five paddocks, the entire flock is now moved from paddock to paddock at roughly three-monthly intervals, care being taken that a different paddock is stocked during each wet season. Since deferred grazing has been practised, flock numbers have been increased to 5,000 in those paddocks.

The cut of wool per head in this wether flock can be taken as a measure of the improvement in the vegetation under the changed system of grazing. It rose from 7.33 lb. in 1954 to 8.16 lb. in 1958.

That this increase was not due to improved seasonal conditions is shown by comparison with the wool yield of a flock of ewes. These ewes were occupying "river" paddocks which, of necessity, have been deferred every year because of the risk of flooding. It is not possible to improve these pastures further so fluctuations in cut of wool per head of the ewes in them are a reflection of seasonal conditions. The poor

seasons occurring over the last few years actually caused the cut of wool per head to fall from 7.34 lb. in 1954 to 6.89 lb. in 1958. The improvement in productivity of the wether paddocks occurred despite relatively poor seasons and despite severe competition from kangaroos, the effective control of which was rendered difficult by the occurrence of natural water.

In most cases rotational grazing may not be warranted; but deferred grazing is essential if the North-West country is to be brought back to anything like its former productivity. The principles involved are straightforward and simple, and can be summarised as follows:—

- (1) Burn the mature stand of spinifex before summer rains are expected. Burn as much of the paddock as is practicable.
- (2) Keep stock out of the paddock during the wet season until seedlings have become established, have matured and have themselves produced seed.
- (3) After the seed drop, stock the paddock fairly heavily to ensure the seed is trampled in before it is blown away or consumed by birds or ants.
- (4) If possible, apply deferred grazing in the same paddock for two wet seasons in succession. This will ensure good seedling establishment from recently-produced seed.



Fig. 13.—Preparing blocks of salt and "1080" poison. Euros did not take salt freely enough to make poisoning by this method effective

As euros cannot be efficiently poisoned unless conditions are ideal for the job, and as pastures can be rehabilitated despite them, attention should be directed first and foremost to pasture management and euros ignored until the occurrence of ideal conditions for poisoning. Deferred grazing, which involves the planned movement of stock, could be made to gear in with a euro control programme. Poisoning in stocked paddocks calls for much more work and attention than poisoning in unstocked country; and the extra trouble involved might discourage many station owners from adopting the method recommended to give the best overall results, i.e., poisoning groups of watering points in one simultaneous drive, and poisoning each one over a period of about a week. If carefully planned, a deferred grazing programme could be arranged so as to leave a substantial section of the property unstocked during the dry season, and euro poisoning operations can be concentrated in this area. Although in general conservative and rather sedentary animals, it is known that euros tend to move from heavily-stocked paddocks into near-by unstocked ones; and this tendency will help to increase the effectiveness of the control measures.

It is unfortunate, but unavoidable, that many birds will be destroyed during a

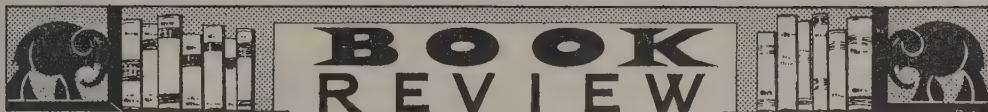
prolonged poisoning campaign. However, seed-eating birds must be regarded as a nuisance in country under deferred grazing, the whole object of which is to encourage and exploit to the full the seed crop of the more nutritious grasses.

The policy recommended here will not exterminate euros from the North-western pastoral country, but it should keep them at a level at which their effect on pasture regeneration is negligible. Stations with natural waters can still be expected to show improvement, although of course competition between sheep and euros will be greater in such country.

ACKNOWLEDGMENTS

The help and encouragement of Messrs. R. Lukis, A. Hardie, D. Shilling, J. Knight, J. Greene and other pastoralists in the district are gratefully acknowledged. Most of the experimental work was carried out on the Abydos-Woodstock Pastoral Research Station, where facilities provided by the Department of Agriculture were maintained by Mr. R. G. Sherlock, the station manager whose co-operation and assistance were appreciated.

Water-consumption data on the plains kangaroo was provided by Mr. D. Gooding of the Vermin Branch. The Assistant Government Chemist, Mr. Gorman, gave useful information on arsenical poisons.



A BOOK ON STOCK DISEASES

Farmers frequently write to the Department of Agriculture requesting advice on the choice of a book dealing with stock diseases. In the past, such requests have not been easy to deal with as—except in the case of sheep diseases—most of the books available were too technical or consisted of overseas publications which were not always suitable for local conditions.

However, the latest (Fourth) edition of "Diseases of Livestock" by T. G. Hungerford, B.V.Sc., H.D.A., is likely to overcome the problem as it is an up-to-date comprehensive book which deals with the diseases of sheep, goats, cattle, pigs, horses, dogs and cats under Australian conditions.

The book contains much general information on animal diseases, including methods of administration of medicines, various aspects of hygiene and disinfection as well as methods of disposing of carcasses.

The sections dealing with diseases of the various animals are preceded by keys to the differential diagnosis of the relevant diseases which will undoubtedly be useful

in aiding a stockowner to sort out the possibilities where trouble is encountered.

All sections are very comprehensive and there is a chapter devoted to vitamin requirements which should prove useful to farmers and veterinarians alike.

While the book is written in non-technical language for the benefit of farmers and students it has proved a useful reference book for veterinarians in the past and in this latest edition they have been catered for by the addition of technical references in many cases and by the inclusion of a Veterinary Physicians' Index which should prove valuable.

The quality of the paper and binding of this edition are a considerable improvement on that of the earlier issues, and for all those interested in the ailments of domestic livestock this volume will prove a most welcome addition to the bookshelf.
—J.S.

("Diseases of Livestock" by T. G. Hungerford. Published by Angus & Robertson, Sydney. Price 80s.)

"PIG RAISING" by L. A. DOWNEY

The latest edition of L. A. Downey's "Pig Raising" which has been revised following the publication of the original in 1951 can be recommended to both students and practical pig raisers alike as a worthwhile volume for the library. It contains the broad aspects of husbandry and many valuable hints for more effective and profitable pig raising.

It appears a little unbalanced in relation to the pages devoted to a discussion of breed characteristics. These are explained at some length and are largely a statement of show ring points.

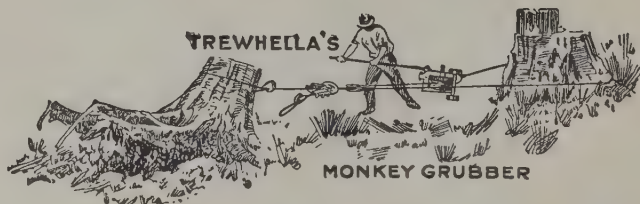
It may be as well to remember that from the point of view of practical pork and bacon production it would be as well for the West Australian reader at least to confine his attention to the most suitable of the two, or possibly three, breeds which

have proved most satisfactory. It is disappointing to see that in the chapter on feeding little attention has been given to the very important aspect of the utilisation of skim milk.

It would also be helpful if the subject of diseases in pigs was discussed more fully. While this type of work cannot be considered a veterinary textbook a description of the more common diseases must prove more helpful to pig raisers.

A chapter on deep litter is useful in dispelling some of the existing fallacies which are held by pig raisers concerning the usefulness of this type of management.—K.N.

("Pig Raising" by L. A. Downey, Published by Angus & Robertson, Sydney, in the Australian Agricultural and Livestock Series. Price 45s.)



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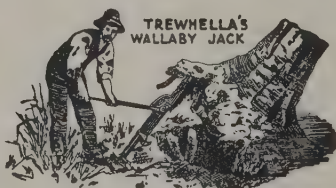
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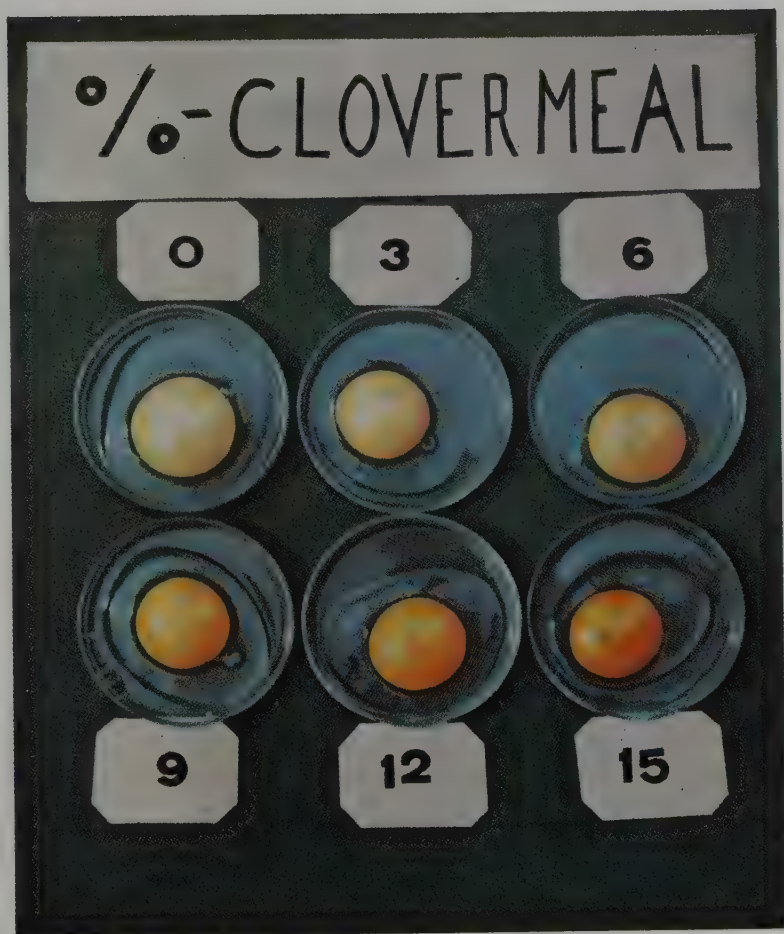
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The improvement in yolk colour resulting from the feeding of increasing amounts of clover meal in the laying ration is illustrated above. The colour associated with the feeding of an 8 to 9 per cent. level in the ration would satisfy the requirements of most people although some may prefer a richer colour.

It should be appreciated that the yolk colour resulting from the feeding of any particular level of clover meal will vary according to the xanthophyll content of the meal used. In England, grass meal is often used in laying rations, and in this State, meal made from high quality meadow hay such as is sometimes produced from our irrigated areas could have a place in poultry feeding.





Fig. 1.—This 54-acre paddock of Woogenellup clover pasture grown by Mr. F. Ford at Woogenellup cut nearly three tons of hay an acre. There are about 60,000 long tons of clover hay produced in the State each year. It is possible that up to 2,000 tons of either clover meal or lucerne meal could be required annually by the poultry industry in the next few years providing good quality meals can be purchased at reasonable prices.

(Photo. by Courtesy of West Australian Newspapers Ltd.)

THE PLACE OF CLOVER MEAL IN POULTRY FEEDING

A progressive report covering the first of a series of clover meal experiments conducted at the Poultry Research Station, Herdsman Lake.

By R. H. MORRIS, Officer-in-Charge, Poultry Branch

THE majority of people both at home and abroad prefer eggs which have golden-coloured yolks. Because of their bright yolks, eggs produced on farms where green feed is fed are strongly favoured by Australians and it is felt that local egg sales would increase if only eggs with golden-coloured yolks were offered to the public.

A check in February, 1959, by three Departmental officers on a cross-section of eggs supplied to the two largest egg receiving floors at Perth and Fremantle respectively showed 36.8 per cent. of the eggs to have very pale yolks, 18.0 per cent. to have yolks of reasonable colour and 45.2 per cent. to have very bright-coloured yolks.

All the eggs received at the two floors during four consecutive days were included in the survey. Five hundred and eighty-four farms forwarded 66,639 dozen eggs during the four days. Three eggs taken

at random from each consignment were broken out and the yolk colour classified into the three abovementioned categories.

The figures show that many farmers do not supply their birds with greenfeed, and as the majority of the eggs in the "pale" category were very pale indeed it is obvious that considerable scope exists for improving yolk colour.

Lucerne meal is an alternative source of the yolk colouring pigment exanthophyll, but unfortunately it is both expensive and in very short supply in

Western Australia. Very little lucerne meal is produced in this State and we have to rely to a large extent on lucerne meal imported from Eastern Australia. Even then the high cost of this imported foodstuff weighs heavily against its widespread use.

The retail price to the farmer of imported lucerne meal was about £45 a short ton in 1958 and in the previous year sold for more than £50 per ton. The local product sells for about £40 a short ton.

A possible alternative yolk colouring foodstuff which is grown in large quantities in this State is clover hay which can readily be made into clover meal.

Very little experimental evidence is available on the feeding of clover meal to poultry but preliminary trials carried out at the Poultry Research Station, Leederville, have shown it to be capable of imparting that desirable golden colour to egg yolks.

Using substandard diets in laying cages it has also been shown to increase egg production by virtue of its nutritive value.

However, no benefit was gained by including 10 per cent. of clover meal in chicken diets fed to both replacement pullets and cockerels for meat.

In view of the good responses with laying birds and because clover meal is retailing for about £27 per short ton at the present time, with a possibility of a price reduction, should a clover meal industry become established, further trials are justified and are being undertaken during 1959 at the Poultry Research Station in order to determine the extent to which clover meal can fulfil the advantages which greenfeed and lucerne meal are known to provide.

A summary of the work already carried out is contained in this paper.

The sample of clover meal used in experimental work during 1958, was derived from the Yarloop variety of subterranean clover grown at Capel, 132 miles south of Perth.

The clover is mown just prior to flowering, and wind-rowed. It is then left to be suncured for a day before being turned. The next day it is baled and subsequently it is hammer-milled. In 1958 a pure stand of the Yarloop variety yielded three tons of hay per acre and it is this material with which we are currently experimenting.

It will be appreciated that the analyses of clover meal will show some variation depending upon the variety, stage of maturity at time of mowing, conditions during the suncuring period and the method of handling. Samples of clover hay which vary in quality will be harvested during 1959 with the object of determining the extent to which the quality of the meal affects yolk colour and egg production.

An analysis of the material used in the experimental work is given in Table I.

Table I
CLOVER MEAL ANALYSIS

	Per cent.
Moisture (as analysed)	10.6
Ash	7.2
Crude protein (Nx 6.25)	10.5
Crude fat (petroleum ether extract)	1.7
Crude Fibre	21.3
Nitrogen-free extractives	48.7
Calcium, Ca	0.95
Phosphorus, P	0.09
	Parts per million
Carotenoids	100
B-Carotene	10

YOLK COLOURING EXPERIMENTS

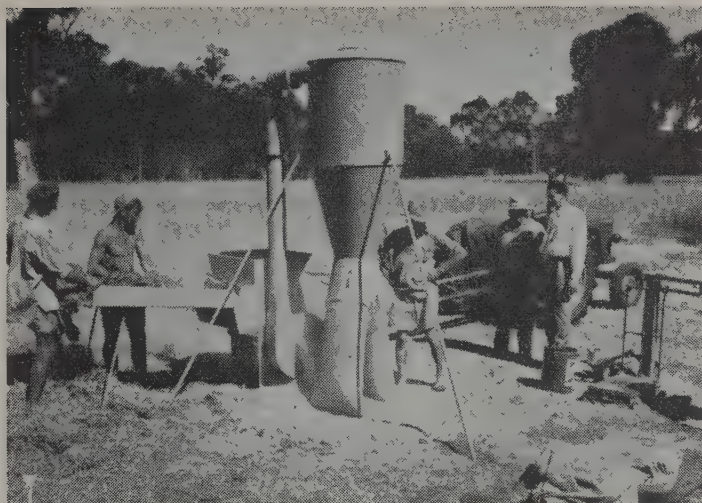
Clover meal was fed at varying levels to groups of laying pullets in cages with the aim of improving egg yolk colour.

Levels of 1, 2, 3, 4, 5, 6, 7, 8, 9 and 10 per cent. of clover meal were included in a basal ration, with six birds on each level. Similarly clover chaff was used at the same levels in another ten rations.

It was found that a period of three weeks was necessary for the colour of the yolk to become stabilised. The group on the 1 per cent. level of clover meal showed a slightly improved yolk colour, but there was no marked colour change below 4 per cent. A level of 5 per cent. clover meal as part of the diet gave a definite response and it was felt that the colour obtained when a level of 8 per cent. was fed would satisfy practically everyone. The 8 per cent. was sufficient to enable the yolks to qualify for the "bright yolk" category referred to in the second paragraph of this article.

The birds on the clover chaff ate it readily and the meal and chaff were equally effective in influencing yolk colour at any of the 10 levels.

Fig. 2.—Clover hay being put through a hammer-mill for the production of clover meal, on the property of Mr. A. E. Dunkley, Capel.



In another trial, levels of clover meal at 3, 6, 9, 12 and 15 per cent. of the ration were fed. The change in yolk colour with each increase in the level of clover meal was quite pronounced and at the 15 per cent. level the colour was extremely bright.

As with lucerne meal the yolk colour obtained from feeding clover meal at any particular level is reasonably uniform in all eggs laid.

In a laying trial a good sample of lucerne meal at a 5 per cent. level in the diet is currently being compared with the same level of clover meal. The colour provided by the clover meal is slightly less pronounced than that obtained from the lucerne meal.

Under industry conditions the actual xanthophyll content of the samples of clover meal or lucerne meal used, together with the intensity of the yolk colour required would determine the level at which the meal should be fed.

However, as mentioned previously the clover meal we have used has given quite a good colour to the yolks, when fed at an 8 per cent. level although some people would no doubt prefer the colour resulting from a higher level in the ration.

LAYING EXPERIMENTS

Once it had been established that clover meal was able to impart the desired yolk colour to eggs, further trials were carried out to determine whether clover meal,

when fed to laying birds, had any other beneficial effects such as increasing egg production by virtue of its nutritive content.

First Cross (W.L. x Aust.) point-of-lay pullets housed in laying cages were used in this experiment which covered a period of 11 months production.

Four treatments were included in the experiment with six replications of 12 birds on each treatment.

Birds on the first treatment were fed the control ration given in Table II. Three different levels of clover meal namely 5 lb., 10 lb., and 15 lb., were added to every 100 lb. of the control diet and these diets which automatically had slightly lower levels of protein than the control diet comprised the remaining three treatments.

Table II

Ingredients						Control Ration
						lb.
Bran	....	....	....	....	....	15
Wheatmeal	....	....	....	....	....	35
Meatmeal	....	....	....	....	....	3½
Whalemeal	....	....	....	....	....	3½
Bone flour	....	....	....	....	....	1½
Oyster flour	....	....	....	....	....	1
Total	....	....	....	....	....	59½

Analysis (Calculated)—

Protein %	....	15.9
Calcium (Ca) %	....	2.3
Phosphorus (P) %	....	0.8

Each of the four diets were supplemented with the required amounts of common salt, manganese sulphate, Vitamin A and D₃.

Records were kept on feed consumption, egg production, body weight, egg size and mortality.

A glance at Table III will show that the addition of clover meal to the control ration had a marked effect on food consumption and resulted in a significant increase in egg production. Body weight was improved slightly but mortality was not affected.

Egg weight was also measured throughout the experiment and it was found that the average weight of the eggs from the birds on the three clover meal rations was slightly higher in each case than for the eggs laid by birds on the control ration. Therefore the increased egg production did not adversely affect egg weight.

The addition of 12 lb. of clover meal to every 100 lb. of this second control diet reduced mortality significantly and improved the average egg production by 15.8 per cent. The pounds of feed required per dozen eggs was reduced from 7.9 lb. for the control diet to 6.1 lb. for the clover meal ration.

However, in the same experiment another treatment was included to test the effect of adding greenfeed to the control diet at the rate of 1½ oz. of fresh kikuyu lawn clippings a bird a day. This stimulated food consumption even more, and lifted the average egg production 13.2 per cent. over the clover meal group.

Although the clover meal did not measure up to the greenfeed under the conditions of this experiment it has been shown in other experiments carried out at the Poultry Research Station that the ratio of mill offal to wheat in relatively

Table III

Ration	Feed consumption per bird per day	Average egg production	Hen Housed Egg Production per bird during 11 months or 334 days from 170 days of age	Pounds of feed consumed per dozen eggs	Mortality	Average egg weight	Body Weight	
							At beginning of experiment—24½ weeks old	At end of experiment
	ozs.	%			%	gms.	lb.	lb.
Control	3.6	44.0	138	6.1	15.3	57.9	3.8	4.3
5 lb. clovermeal	4.0	51.5	168	5.8	4.2	58.1	3.8	4.6
10 lb. clovermeal	4.0	54.3	169	5.6	16.6	58.1	3.8	4.5
15 lb. clovermeal	4.2	55.8	178	5.6	7.0	58.4	3.8	4.6

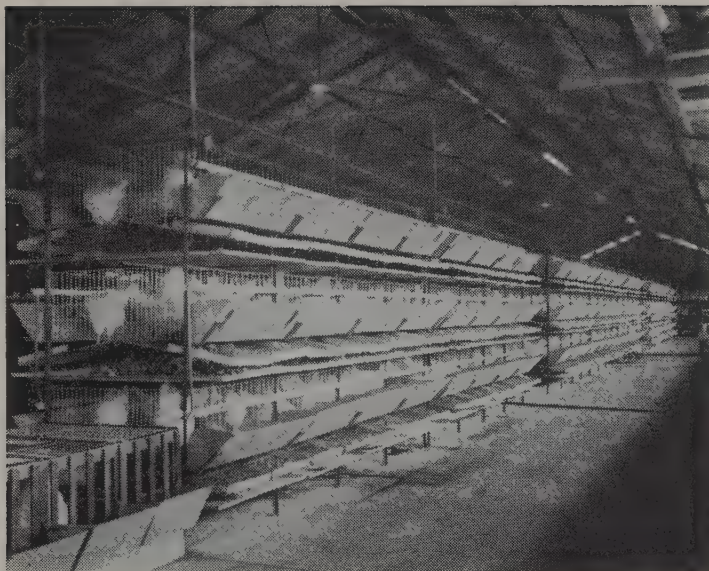
The control ration in this experiment is a relatively simple diet known to be inadequate for maximum efficiency in laying cages. For each of the levels of clover meal added to the control ration there was a significant improvement in egg production, the rations with the higher levels of clover meal (10 lb. and 15 lb.) giving the best production.

A second laying trial also carried out in laying cages over an 11 month period, tested the effect of adding clover meal to an unsupplemented higher energy ration which was known to be even more inadequate for maximum production in cages, than the control diet used in the previous experiment.

simple diets and whether or not the layers are housed in cages have an influence on the results obtained when greenfeed is fed.

Trials now in progress are expected to yield further information on the benefits to be obtained by including greenfeed, lucerne meal, or clover meal in laying rations under both cage and floor conditions and also information on the effect of supplementing these rations with other nutrients. In the meantime it has been shown that clover meal does enhance the feeding value of an otherwise substandard diet and what is perhaps more important it brings about a marked improvement in yolk colour when fed at an 8 per cent. level in the ration.

Fig. 3.—Batteries of laying cages at the Poultry Research Station Herdsman Lake. These cages were used in the clover meal experiments.



COCKEREL FEEDING EXPERIMENT

Although encouraging results have been obtained by including clover meal in laying rations, there does not appear to be any advantage in including clover meal at a 10 per cent. level in rearing diets. Trials have been carried out at the Research Station with both cockerel and pullet rearing diets which contained 10 per cent. clover meal but in neither case did the clover meal group show an improvement on the unsupplemented control group.

In the cockerel experiment, 300 day-old First Cross cockerels were divided into three treatments and brooded on litter under a hot water system in 12 groups of 25 birds. At the age of five weeks the cockerels were transferred to small deep litter units still in their 12 groups of 25 birds.

Records were kept on mortality, feed consumption and gain in body weight until the age of 12 weeks when the birds were marketed.

The three different rations fed from day-old consisted of a control ration, the control ration plus greenfeed and the control ration with 10 per cent. clover meal incorporated in it.

The composition of the three rations in which the calculated protein content was 18 per cent. was as follows:—

Table IV

Ingredients	Control	Green-feed	Clover Meal
Wheatmeal	lb. 30	lb. 30	lb. 30
Bran	10	10	10
Dried buttermilk			
Powder	2	2	2
Whalemeal	3½	3½	3½
Meatmeal	3½	3½	3½
Boneflour	1½	1½	1½
Clover meal	Nil	Nil	5½
Greenfeed	Nil	¾ oz. per bird per day	Nil
Total	49½	49½	55

Each ration was supplemented with the required amounts of common salt, manganese sulphate, synthetic riboflavin, Vitamin A and Vitamin D₃.

During the 7 to 12 week period the buttermilk powder was deleted from the rations but the protein was kept constant at 18 per cent. by increasing slightly the quantities of whalemeal and meatmeal.

It can be seen from Table V that the birds on the clover meal ration ate slightly less than the birds in the other two groups. The lower feed consumption in the clover meal group was consistent in each replication within the treatment and

corresponded very closely to the average body weight of the birds on each treatment.

The mortality record showed a lower death rate in the clover meal group but this result was not significant and in no case could the mortality be associated with any of the rations. A large number of deaths, of unknown causes, occurred in the first few weeks and the remainder of the losses were due to coccidiosis and nephritis.

Table V

Treatment	Average body weight per bird at 12 weeks		Average feed consumption per bird	Conversion ratio	Mortality
	lb.	oz.	lb.		%
Control	2	9·7	9·27	3·75	20
Control + greenfeed	2	11·1	9·39	3·62	20
Control with 10 per cent. clover meal	2	7·7	9·00	3·80	12

PULLET FEEDING EXPERIMENT

A similar result was obtained in a trial carried out in 1956 with pullets instead of cockerels. In this case rearing records were kept from day-old to 18 weeks and these show once again that the inclusion of clover meal in the diet of young stock at a 10 per cent. level was of no advantage.

The birds were reared on litter with three replications of 60 birds (180 birds) on each treatment. Although there was no appreciable difference at 18 weeks in mortality between the three treatments the conversion figures for both the control group and the group with greenfeed were significantly better than for the group on clover meal.

Table VI

Treatment	Mortality to 18 weeks	Conversion ratio	Average weight per bird	Feed consumption per bird
	%		lb.	lb.
Control Ration	8·6	5·32	3·05	16·23
Control Ration plus greenfeed	9·4	5·05	3·15	15·89
Control with 10 per cent. clover meal	8·6	5·68	2·98	16·93

CONCLUSIONS

In summing up the work done with clover meal it is clear that there is a need for further investigation into several aspects of the feeding of this material to poultry. Further trials which should yield

useful information are at present in progress.

At the present stage it can be said that clover meal does have a place in the nutrition of laying stock not already receiving greenfeed or lucerne meal chiefly by virtue of the ability of clover meal to impart the all-important golden colour to the egg yolk and partly, also due to its nutritive value in the case of certain basal rations.

Trials carried out with clover meal in rearing diets for both meat chickens and pullets showed that there was no advantage in feeding this product at a 10 per cent. level to young stock.

The potential for a clover meal industry exists in Western Australia. Large areas of clover hay are grown and several tons of meal suitable for feeding to poultry were produced in 1958.

If subsequent trials at the Poultry Research Station show clover meal to compare favourably with lucerne meal on the basis of its ability to improve both yolk colour and egg production and if clover meal continues to be considerably cheaper than lucerne meal it is possible that relatively large quantities of clover meal will be used in laying rations in the future.

In the meantime, as about 90 per cent. of the public have a definite preference for eggs containing bright coloured yolks, more farmers should feed fresh greenfeed to their laying fowls with the object of supplying this class of egg.

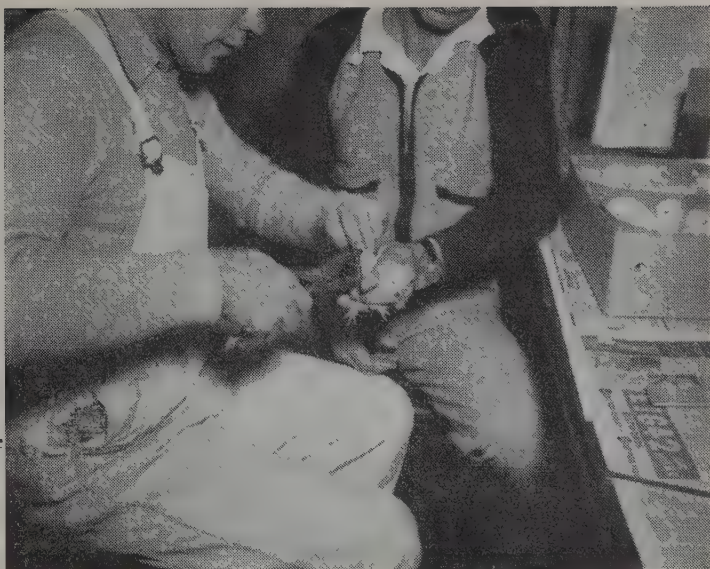
ACKNOWLEDGMENT

Grateful acknowledgment is made to the staff at the Poultry Research Station for their co-operation in this work.

CORRECTION

In the reprint of Mr. K. Needham's radio talk "Farm Water Supplies" (March-April 1959 issue, page 225) it was stated that "water containing up to 600 grains per gallon may be used in a septic tank system." The correct figure is 700 grains.

Fig. 1.—A wing band in each wing ensures correct identification for life



First Western Australian Random Sample Egg Laying Test

By R. H. MORRIS, B.Sc. (Agric.), Officer-in-Charge, Poultry Branch

IN 1948 the first Random Sample Egg Laying Test was established at Modesto, California, U.S.A., and since that time many such tests have been started throughout the world. These tests enable a far more accurate evaluation of laying stock to be made than was possible under the once popular Egg-Laying Trial method of testing, and as part of the Poultry Improvement Plan for Western Australia the Department of Agriculture inaugurated a Random Sample Laying Test at the Poultry Research Station, Herdsman Lake, in 1957.

The test determines the economic worth of commercial day-old pullet chicks sold by West Australian hatcherymen and provides breeders and hatcherymen with a strong incentive to improve the laying capacity of the State's poultry flocks.

Any hatcheryman whose stock achieves above average results in several consecutive tests can expect to increase his chicken sales. Superior stock will also be worth more and it is reasonable to assume that commercial chick buyers will be prepared to pay more for their chickens if they can be shown proof, based on several

years of Random Sample Test results, that they stand to make extra profits themselves by buying highly productive stock.

HOW WILL THE STOCK BE IMPROVED?

The answer to this question rests with our poultry breeders, an increasing number of whom are establishing breeding projects which are expected to result in genetic improvement in our fowls. However, there is a lot of work associated with a soundly based poultry breeding programme. Large numbers of birds are



Fig. 2.—Day old chicks being confined to the brooder by metal surrounds which are 18 inches high

required to avoid too close inbreeding and no system will achieve good results unless accurate records are kept of egg numbers, egg weight, age at sexual maturity, viability and hatchability to mention some of the more important factors which have to be measured if progress is to be made. The records are substantial even when the simplest form of sire-family selection is practised and become considerably more involved when a system which combines family selection with individual bird selection is employed.

The keeping and analysing of records together with the management of the breeding flock calls for much time, effort and expense on the part of the breeder and whereas breeding work to date has usually been carried out by farmers who have no direct outlet for commercial chickens, and who are therefore unable to take full advantage of any progress they make, it is expected that this situation will change. Indeed the scene is already undergoing a rapid change, less than two years after the introduction of random sample testing.

The reason is not difficult to find. The Random Sample Test assesses the worth of commercial-grade chickens sold by hatcheries, and in order to be sure of the

quality of the chickens they sell, most hatcherymen agree that they must have the nucleus breeding work under their own control. They cannot afford to be dependent on other people for this work which is so vital to their success, and with some hatcheries selling chickens to the value of several thousands of pounds annually, it is easy to understand why so many hatcherymen are anxious to safeguard their own interests. So we see hatcherymen in general taking a greater interest in breeding work and in many cases actually doing the breeding on their own farms. The improved pure-bred stock is then passed to the multiplying farms where it is mated under direction from the breeder-cum-hatcheryman for the production of commercial cross-bred stock, the fertile eggs being sold back to the parent hatchery.

Having improved the pure-bred stock it would be advisable for the breeder to make certain that the resulting cross-bred stock is also good. This requires further testing work either by the breeder himself or by co-operating poultry farmers who assist him to obtain the information by recording the performance of the commercial stock under field conditions.

Having satisfied himself that he is in fact selling a good quality chicken, the

hatcheryman submits an entry to the Random Sample Test where it competes under uniform conditions with other commercial stock.

INCENTIVE NECESSARY

As mentioned earlier, consistently good performance by a particular hatcheryman's stock over several years of testing should enable that hatcheryman to increase his chicken sales and should also enable him to obtain more per hundred for the chickens which he sells. For instance in America, many commercial grade day-old pullets sell for 30 cents each, but other strains bring up to 60 cents each. It will thus be seen that the hatcheryman stands to gain in two ways.

Unlike the small breeder without a hatchery, the hatcheryman is in a position to negotiate directly with the chick buyer. He does not have to rely on a middle-man to provide him with a reward for his work which may or may not be considered a reasonable one by the person doing the actual breeding work, and this is a big advantage in favour of the hatcheryman doing the nucleus breeding work himself.

There is a strong incentive for him to improve his stock, and a little success in the first few years should lead to continued success. If he is a wise man, the breeder-cum-hatcheryman will plough the profits which he makes in the early years back into his breeding work, so enlarging his

programme and intensifying his work—and all the time the inherent capacity of the State's laying flocks to produce more eggs and to return a greater profit should be improving. That is the aim of the Poultry Improvement Plan of which the Random Sample Test is an essential part.

CHICK PRICES COULD VARY ACCORDING TO QUALITY

Most people agree that a hatcheryman who sells quality chicks will sell more of them, but there has been a reluctance on the part of chicken buyers generally, to pay more than a set price for their chickens. This reluctance can be understood, when it is realised that the chicken buyer has had no guarantee in the past that he was likely to obtain a better chicken by paying more for it. There was no yard-stick! There was no Random Sample Test.

Now that we have a test and the chick buyer will be able to find out where the superior stock can be obtained, it is important for him to realise how much he stands to gain through buying good quality stock, even if he has to pay more for it, and it is equally important for the hatcheryman to know how much extra profit he can make by receiving a few extra pounds per hundred for the superior stock which he sells.

An example will be used to illustrate this point, but it is emphasised that the



Fig. 3.—The brooder house in the foreground and the second rearing shed in the distance each located in the centre of their respective range areas

SUMMARY OF YEAR'S RESULTS

[illegible][illegible]

LAYING PEN RECORD CARD

Pen No. 24. No. of Birds 12. Period Commencing Monday, April 7th, 1958

DAY	EGG COLLECTIONS				TOTAL	Dead W.B. No.	Broody W.B. No.	Food lb.	REMARKS
	A	B	C	D			Date out/in		
Mon.	6	3	....	....	9	....	0457/8 out	....	To laying cage No.5
Tues.	4	4	....	....	8	....	....	10	
Wed.	7	3	....	....	10	....	....	....	
Thurs.	5	3	....	....	8	0455/6	....	....	Sent to laboratory
Fri.	6	1	....	....	7	....	....	....	
Sat.	5	1	....	....	6	....	0457/8 in	....	
Sun.	4	4	....	....	8	....	....	10	
TOTAL	37	19	....	....	56	....	....	20	

The laying pen record cards shown in front of the pens in photos 5, 6, and 7, cover a period of four weeks. The type of information recorded on these cards during one week is shown above.

At the end of each week this information together with that obtained from the three sister pens in the same entry is transferred to that particular entry's history sheet.

The type of information recorded on the history sheet is shown on page 302. The provision for progressive totals at weekly intervals on this sheet allows each figure to be cross balanced as the data becomes available, so reducing the risk of error.

figures used are not intended to serve as a basis for negotiation between chick buyer and seller. The prices actually received for chickens of varying quality in the future will work themselves out as time passes.

However, for our present purpose let us assume day-old pullet chicks of average quality to be worth £15 a hundred. We will call this strain, "Strain A."

Let us also assume that another strain, "Strain B," is on offer by a hatchery, which over several tests consistently shows a profit of 3s. a bird more than that shown by birds belonging to "Strain A." This 3s. can of course, be made up in a number of ways, such as through the strain having good viability, or particularly good egg size, etc., but for the sake of simplicity, let us confine our comparison to egg numbers.

All other factors contributing towards profitability being equal, "Strain B" would require to lay eleven eggs per bird per year more than "Strain A" (with eggs at 3s. 6d.

a dozen) in order to return an additional profit of 3s. per bird.

If this happened, and there is no reason why it should not, a chick buyer would be able to pay £30 a hundred for "Strain B" chickens and still make as much profit as if he had bought the same number of "Strain A" chickens for just half the price.

Let us now assume that only £18 per hundred is asked for "Strain B" chickens instead of £30, and see how a farmer who bought 2,000 chickens and the hatcheryman who sold them, would fare financially.

The 2,000 pullets would cost the farmer an extra £60, but an additional profit of 3s. a bird on 2,000 chickens amounts to £300, and if we deduct the extra price of the chickens, namely £60, from this figure, the farmer is left with an additional £240 in the bank. Quite a fair investment to say the least, and facts like these help to explain why some chickens in other countries command a premium price.

Fig. 4.—A busy time is had by all when the birds reach 18 weeks of age, and are transferred from the range to their laying quarters. Each bird is identified by its two wing-band numbers before being leg-banded, debeaked, weighed and placed in its appropriate laying pen. A few days earlier each bird is de-wormed with 3 c.c.s. of carbontetrachloride.

The laying cages shown in the background are used to hold broody birds for five days and are extremely useful for this purpose.



But what of the hatcheryman who has bred this superior stock? How does he fare?

If he has a reasonably sized business and sells 50,000 day-old pullets annually for £18 a hundred instead of the usual £15, he would clear an extra £1,500. He would thus obtain some additional capital with which to expand his breeding work, and we hope, produce chickens of even better quality in the future.

These are the reasons why the test in Western Australia has been restricted to the testing of commercial-grade chickens as distinct from breeders'-grade chickens.

It is considered more important to test the end-product of the breeding work, that is the commercial chickens themselves, rather than the various strains which are crossed to produce these commercial chicks and about which the breeder already has good information from the records he keeps in association with his breeding programme.

In the long run, it is reasonable to assume that the commercial chick buyer will be prepared to pay his share of the expenses associated with this breeding work, but he will only be prepared to pay for superior chicks if he knows that the chicks which he actually buys are in

fact superior. The Random Sample Test will enable him to obtain this information.

THE FIRST TEST

Sampling.

The test has been well received and strongly supported by hatcherymen throughout the State, so that in 1957, 27 crossbred entries were received from 27 commercial hatcheries. Facilities are provided for testing 30 entries if necessary.

Each entry consisted of 55 day-old sexed pullets which were selected at random at time of hatching by an officer of the Department of Agriculture so that each sample was truly representative of the crossbred stock which that hatcheryman sold.

Whenever practicable, sampling officers were accompanied by a representative of the Poultry Farmers' Association who acted as a scrutineer.

The samples were taken over a six-day period as close as possible to August 12, 1957.

In future tests, entries of pure-breed stock will also be admitted providing the hatcherymen who make application for pure-bred stock sell at least 2,000 female chickens of the breed applied for in that

year. This requirement also applies to crossbred entries and each hatcheryman will only be entitled to one entry in each test as at present.

Brooding and Rearing.

After being wing-banded in both wings, the chicks were brooded on litter with the use of a hot water system and in a brooder house which allowed $\frac{1}{2}$ square foot of floor space per chicken up to the 6-weeks-old stage.

There were eight brooding compartments each measuring 9 ft. x 10 ft., and, with the object of providing a uniform environment, chickens from each entry were spread evenly over four compartments.

At six weeks, one-half of the chickens from each entry were transferred to a second shed which was similar to the brooder shed in construction.

Each shed was located in the centre of a fenced-off range area (see Fig. 3) and the birds were allowed to range from the age of four weeks. Prior to this, the chickens had access on fine days, to small outside runs attached to each brooding compartment. At four weeks, the chickens were shut off from these small runs, which for purposes of sanitation, remained un-

stocked until 48 weeks later when the following year's test chickens were housed.

Basis of Test.

Officially the test does not start until the chickens are eight weeks old

At this age any cockerels that may be present owing to sexing errors are removed, and all pullets in excess of 48 per entry are balloted out.

The aim is to have each entry represented by 48 pullets at eight weeks, but if mortality in some entries is particularly high prior to eight weeks then those particular entries may commence the test with fewer than 48 pullets without being penalised in any way.

In commercial practice early chick mortality is usually not of great economic importance and as the assessment of entries of the Western Australian test is on economic grounds, it was considered advisable to disregard losses which occurred prior to 8 weeks.

The pullets remain on range until the 18-weeks-old stage when they are transferred to the laying quarters. These consist of two lines of intensive deep litter sheds (see Fig. 7). In all, 120 pens, each 8 ft. x 6 ft. are provided and at 18 weeks the 48 birds from each entry are allocated at



Fig. 5.—The test was officially opened on April 16, 1953, by the Minister for Agriculture (Mr. L. F. Kelly, M.L.A.). A field day was held in conjunction with the opening and here some of the visitors are shown inspecting the laying birds.

random to four of these small pens. These 12 bird groups then undergo a 50 week laying test.

Evaluation of Entries.

Entries are evaluated according to the profit returned by each bird commencing the test at eight weeks (see Table E). The value of the food eaten by each entry for the 60 weeks from the eight-weeks-old stage is subtracted from the income figure (value of eggs laid plus carcass values of survivors at 68 weeks) and the gross profit figure for the entry is then divided by the number of pullets officially commencing the test at eight weeks.

(a) **Carcass Values.**—Carcass values are based on a standard price per pound irrespective of the bird's body weight.

(b) **Egg Values.**—Egg values are calculated on values established by the candling and grading of one day's production per week throughout the laying period.

Egg values conform with standard Egg Board gradings and values in force at that time—on a net return to producer basis.

(c) **Food Values.**—All food fed during the 50 week laying test period was weighed and valued at 3.9d. per pound. The food eaten during the rearing period (9-18 weeks) was valued at 3.5d. per pound.

As all entries were run together on range from the nine to the 18-weeks old stage, it was not possible to measure the food eaten by the birds in each entry during this period and for this figure we had to rely on one derived from a formula kindly supplied by Mr. S. T. King of the United States Department of Agriculture. When the Australian poultry study team met Mr. King in 1956, he was stationed at Purdue University, Lafayette, Indiana, and he had previously brought this method of calculating food consumption to our notice at the Poultry Science meeting held at the North Carolina State College.

The formula allows the food consumption of a bird to be calculated at any stage during the growing period when the body weight of that bird is known.

The formula is used in both the United States of America and Canada, but before

adopting it locally, it was applied to two groups of W.L. x Aust. cross-bred pullets reared at the Poultry Research Station in 1955 and 1956 respectively. Accurate body weights and food consumption data were kept on 480 experimental pullets during these two years.

At 20 weeks the 1955 birds averaged 3.6 lb. in body weight and had eaten 18.5 lb. of feed from day-old. At 18 weeks the 1956 birds averaged 3.0 lb. in body weight and had eaten 16.45 lb. of feed.

The formula for determining food consumption when the body weight is expressed in pounds is:

Food consumption in pounds = $5.6 + 3.578$ times the body weight, and if we apply this formula to the 1955 birds we get:

Food consumption = $5.6 + (3.578 \times 3.6)$
= 18.48 lb., and with the 1956 birds:

Food consumption = $5.6 + (3.578 \times 3.0)$
= 16.33 lb.

This shows the calculated and actual food consumption figures for the 1956 birds to differ by only 0.12 lb. per bird or 1.9 oz. per bird, with virtually no difference at all showing with the 1955 birds.

In view of the closeness of the results we had no hesitation in using the formula in our Random Sample Test work.

It should be mentioned that the figure of 5.6 used in the formula can vary from 4.41 to 6.97 depending on the energy level of the feed, differences in climate, and differences in age at the time of housing, but as will be seen from the above, the constant of 5.6 recommended to us enabled close agreement to be obtained between the true and calculated result. In any case even if the constant used is not completely accurate, no harm results from using it in this type of work since the same constant is applied to all entries.

The formula is used to calculate the food eaten from day-old, but as our test does not start until the chickens are eight weeks old, the food eaten per bird during the first eight weeks, namely $3\frac{1}{2}$ lb., had of course to be deducted from the calculated figure. The figure of $3\frac{1}{2}$ lb. is based on work carried out at the Research Station.

When a bird dies during the rearing period, the value of the food which it has eaten from the 8-weeks-old stage to time of death is debited against the entry concerned.

Egg Gradings and Egg Size.

As will be seen from Table C, first quality hen eggs are graded into three grades in Western Australia. These are known as the 12 lb., 14 lb., and 16 lb. packs respectively. The grades are based on the weight of a "long hundred" of ten dozen eggs, the smallest pack containing ten dozen eggs and weighing 12 lb.

In addition to the three local grades, there are two export grades for eggs of the very highest quality and which in other respects would qualify for the 14 lb. and 16 lb. packs respectively. As an incentive for quality, an export grading carries with it a premium payment of twopence per dozen over and above the price paid for the corresponding local pack.

The 12 lb. local pack includes eggs which weigh from $1\frac{1}{2}$ oz. to less than $1\frac{3}{4}$ oz. each; the 14 lb. pack, eggs of not less than $1\frac{3}{4}$ oz. but less than 2 oz. each; and the 16 lb. pack, eggs which weigh not less

than 2 ozs. each. For the export 16 lb. pack, only eggs which weigh between 2 oz. and $2\frac{3}{8}$ oz. inclusive are accepted.

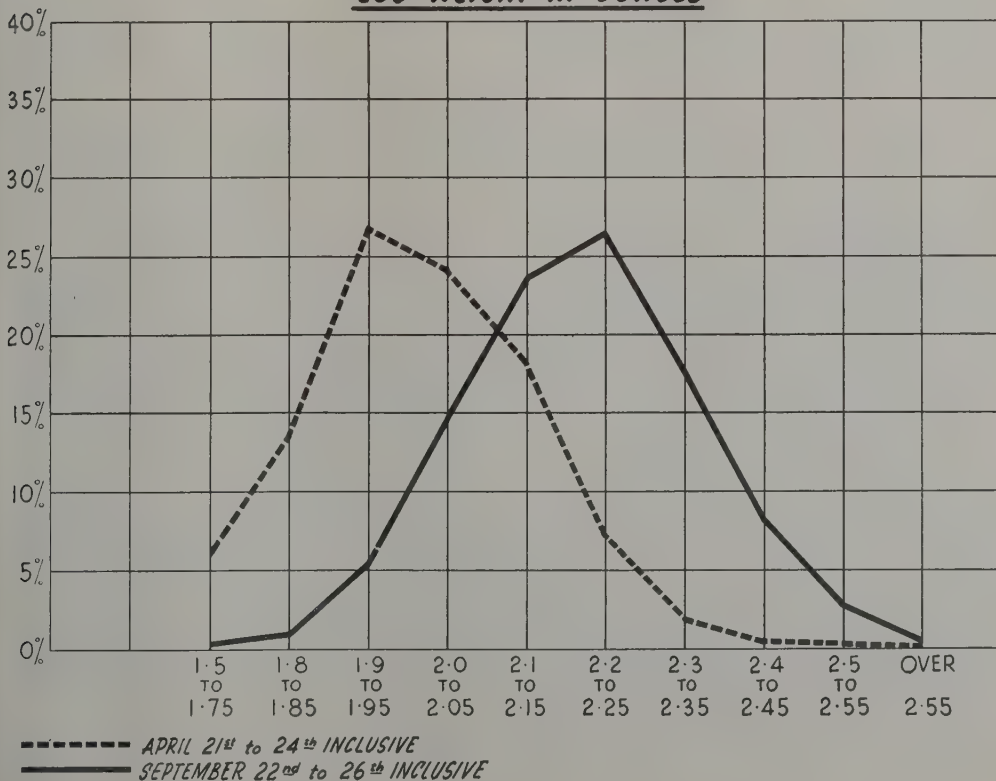
Average egg weight figures for each entry were determined at fortnightly intervals throughout the laying period by bulk weighing all eggs laid on a particular day.

The true average figure for the year shown in Table C, column 2, was then calculated from the fortnightly figures.

The graph showing the distribution of eggs by weight at two periods in the test shows how egg size increased as the year progressed.

The broken line relates to 2,863 eggs laid by all entries from April 21 to April 24, 1958 inclusive, i.e., during a four day period at 36 weeks of age. At this time 26.8 per cent. of all eggs laid weighed between 1.90 and 1.95 ounces inclusive, and 7.3 per cent. of the eggs weighed between 2.20 and 2.25 ounces inclusive.

EGG WEIGHT IN OUNCES



Later in the year when the birds were 59 weeks of age, 3,463 eggs laid by all entries from September 22 to September 26 inclusive were weighed and it was found that only 5.5 per cent. of them weighed between 1.90 and 1.95 ounces while 26.5 per cent. of them weighed between 2.20 and 2.25 ounces inclusive.

Feeding.

The birds were fed under the all-mash system, the rations being changed according to the age of the birds.

The growing stock were dewormed twice. At 10 weeks, each bird was drenched with $1\frac{1}{2}$ ccs. of carbon-tetrachloride and at 17 weeks with 3 ccs. of carbon-tetrachloride.

ALL-MASH RATIONS FED TO RANDOM SAMPLE TEST BIRDS

INGREDIENTS	CHICKEN RATIONS			LAYERS RATIONS
	1-8 weeks	9-12 weeks	13-18 weeks	From 18 weeks
Bran	lb. 25	lb. 25	lb. 25	lb. 20
Pollard	10	10	10	10
Finely Gristed Oats	10	10	10	10
Gristed Wheat	60	60	60	60
Wheatmeal (66 per cent. protein)	5	5	4	7
Meatmeal (50 per cent. protein)	6	5	4	8
Dried Buttermilk Powder	3	2	....	....
Dried Brewers' Yeast	2	....	....	....
Bone Flour	3	$3\frac{1}{2}$	4	$2\frac{1}{2}$
Oyster Flour ....	....	....	....	$2\frac{1}{2}$
Common Salt (fine)	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	....
*Common Salt, Manganese Sulphate mixture	....	....	....	10 oz.
Manganese Sulphate	1 level teaspoon	1 level teaspoon	1 level teaspoon	....
†Synthetic Riboflavin mixture	$\frac{1}{2}$	....	....	....
Vitamin A and D3 Feeding Supplement	According to the Manufacturers' Recommendations			
TOTALS	125 lb. plus 1 teaspoon	121 lb. plus 1 teaspoon	117 $\frac{1}{2}$ lb. plus 1 teaspoon	120 lb. 10 oz.
Estimated crude protein content	16 per cent.	15 per cent.	14 per cent.	16 per cent.

* The common salt, manganese sulphate mixture is obtained by mixing 2 oz. of manganese sulphate in 10 lb. of finely ground common salt. For the above layers ration, 10 oz. of this mixture are used in every 120 lb. of mash.

Greenfeed : The laying birds are fed fresh kikuyu lawn clippings daily at the rate of $1\frac{1}{2}$ oz. per bird.

Insoluble Grit : Irrespective of age, the birds always have free access to insoluble grit.

† The synthetic riboflavin mixture is made by thoroughly mixing a 4 gm. packet of "Ribon" into 16 lb. of pollard, making a premix first and then gradually breaking it down with the 16 lb. of pollard.

Each entrant was provided with the egg size pattern of his own entry at the two periods in the year mentioned above, together with the average pattern of all entries. Additional data relating to egg size and contained in Table C, enables each entrant to compare the egg size of his entry with all other entries.

Generally speaking, egg size cannot be regarded as a major problem in Western Australia at the present time, but as egg size can easily be sacrificed at the expense of egg numbers, breeders should strive to preserve an economic balance between these two factors in their future flock improvement work.

Cannibalism was effectively prevented by debeaking the birds at the time they were housed in the laying pens (see Fig 4).

Entrants' Names not Disclosed.

Each entrant is given his own test result in detail together with the results which appear here, but the names of hatcherymen participating in the test are not disclosed as it is considered that more harm than good could result from such a practice.

Entry to the test is voluntary and if the test is going to help some hatcherymen sell more chickens, it must automatically make



Fig. 6.—To obtain the information contained in the graph on page 309, all eggs laid during a period of several days in April and September, respectively, were weighed.

Separate egg collections are also made at regular intervals throughout the year to obtain other data relating to egg size and to enable egg values to be established by forwarding representative egg samples from each entry to the Western Australian Egg Marketing Board.

On the majority of days eggs are collected directly into keyes fillers to save on time and labour.

Although the operations of feeding and egg collecting are being undertaken together in this picture these two chores are normally carried out separately.

The pen card is used to record data relating to egg production, food consumption, mortality, broodiness and any other observations.

it difficult for other hatcheries to maintain their chicken sales. As many hatcherymen have built up their businesses over a period of many years at

considerable expense to themselves, it is important that any changes in the buying habits of chick buyers should be based on sound grounds.



Fig. 7.—The two rows of intensive laying pens surrounded by lawns. In all there are 120 6 ft. x 8 ft. pens and the birds from each entry occupy four of these. A row of cape lilacs along the back of each line of sheds will provide effective shade in the future and still allow the sun to enter the pens through the front wall

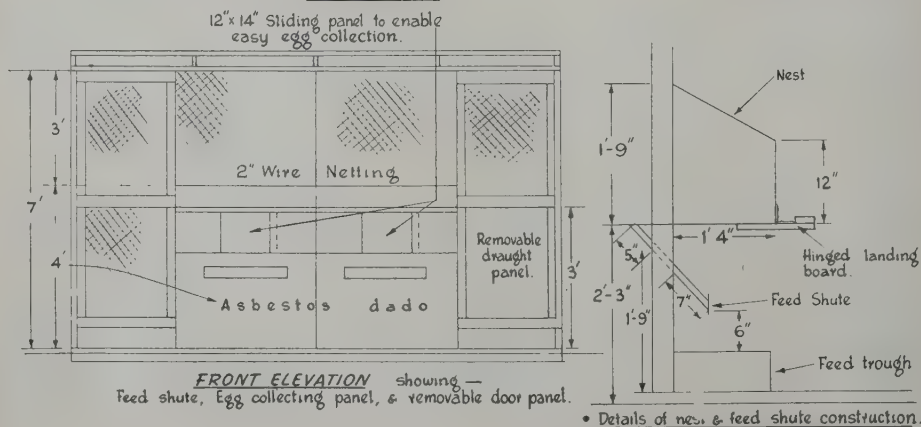
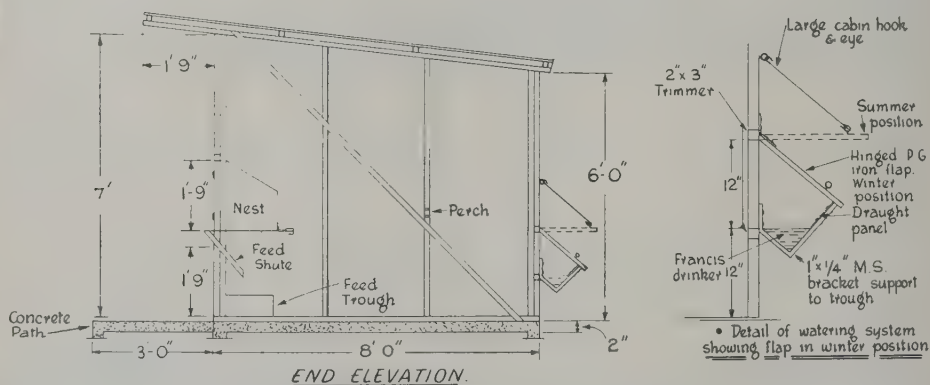
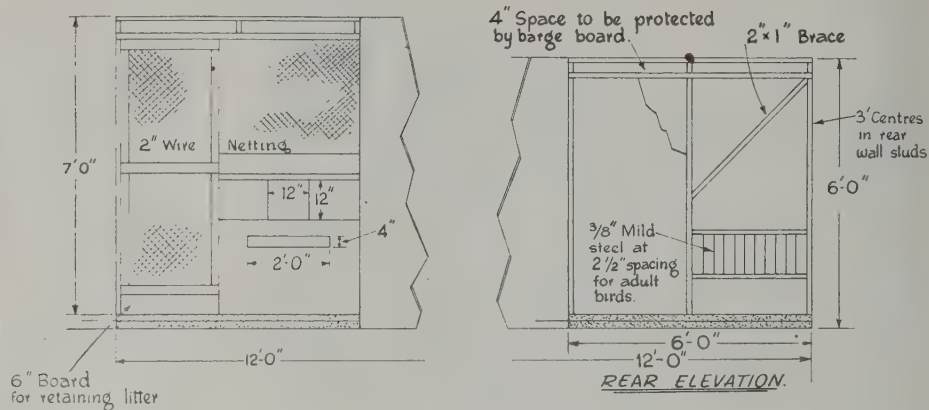


Fig. 8.—Diagram showing constructional details of laying pens

Despite the fact that every effort is made to obtain a true result from each entry, results from a particular year's test can be misleading and several years must elapse before we can compare the stock supplied by the various hatcheries with any degree of confidence. Notwithstanding repeated advice to this effect, there is a tendency for the public to place undue importance on the results of individual tests.

In every test, someone has to come first and someone last. If a list of names is published there is always a possibility of the top entry receiving more credit than it is entitled to. Although an entry comes first, the margin may be so small that it may not in fact be any better than any of the first say, six or seven entries. However, undue recognition in this regard is not nearly so undesirable as a poor entry receiving unnecessary publicity to the effect that it has obtained a sub-standard result.

Notwithstanding the fact that a certain hatchery's stock may perform poorly in an

early test or in several early tests for that matter, the hatcheryman concerned may nevertheless be particularly keen to supply good quality stock, and may already have a breeding programme in hand which could produce some of the best stock in Western Australia in a few years time. But unless he is given a breathing space, that is, time in which to develop this good stock without having his business seriously interfered with in the meantime, through substantially reduced chick sales, this man may be deprived the opportunity of ever rendering a service to the industry in this way.

Changes will undoubtedly come, but let them be gradual. At this stage it is best that the top men enjoy reasonable prosperity without the less successful being completely discouraged.

ACKNOWLEDGMENT

Grateful acknowledgment is made to the staff at the Poultry Research Station and to Mr. F. A. E. Hunt for his preparation of the test results.

Table A
MORTALITY, BROODINESS AND BODY WEIGHT

Entry	Breed	No. of pullet chicks officially starting test at 8 wks. of age	MORTALITY Based on No. of chicks alive at 8 wks. of age				No. of birds alive at conclusion of test (68 wks. of age)	Broodiness recorded as the percent. of birds housed at 18 wks. which were broody one or more times	Incidences of Broodiness per entry	Average weight of birds in lb. at		
			9-18 wks.		19-68 wks.					18 wks. of age	35 wks. of age	68 wks. of age
			No.	%	No.	%						
1	W.L. x Aust.	48	....	....	2	4.2	46	6.3	3	2.7	4.5	4.7
2	" "	48	1	2.08	1	2.1	46	6.4	3	2.7	4.6	4.9
3	" "	48	....	....	1	2.1	47	4.2	3	2.8	4.6	4.9
4	" "	48	....	....	2	4.2	46	4.2	2	2.8	4.6	4.9
5	" "	46	....	....	1	2.2	45	17.4	11	2.9	4.8	5.4
6	" "	48	....	....	2	4.2	46	2.1	1	2.9	4.6	5.0
7	" "	48	....	....	3	6.3	45	10.4	7	2.8	4.8	5.3
8	" "	48	1	2.08	3	6.3	44	2.1	1	3.0	5.0	5.3
9	" "	47	....	....	2	4.3	45	4.3	3	2.9	4.6	4.9
10	" "	46	....	....	....	....	46	21.7	19	3.0	5.1	5.5
11	" "	48	....	....	3	6.3	45	14.6	12	2.7	4.5	4.9
12	" "	48	....	....	2	4.2	46	8.3	17	2.7	4.5	5.0
13	" "	48	....	....	1	2.1	47	8.3	11	2.8	4.6	5.1
14	" "	48	....	....	....	....	48	12.5	12	2.7	4.4	4.7
15	" "	48	....	....	2	4.2	46	6.3	3	2.8	4.8	5.2
16	" "	48	....	....	3	6.3	45	8.3	5	2.8	4.9	5.4
17	" "	48	....	....	4	8.3	44	12.5	10	3.0	5.1	5.6
18	" "	44	....	....	4	9.1	40	N/A	N/A	2.9	4.8	5.2
19	Aust. x W.L.	48	....	....	1	2.1	47	18.8	19	3.0	4.9	5.5
20	W.L. x Aust.	48	....	....	8	6.3	45	10.4	8	3.0	5.0	5.5
21	" "	48	1	2.08	3	6.3	44	N/A	N/A	2.7	4.7	5.0
22	" "	48	....	....	5	10.4	43	4.2	2	2.9	4.8	5.2
23	" "	48	....	....	2	4.2	46	4.2	2	3.0	5.0	5.3
24	" "	47	1	2.13	3	6.3	43	2.1	1	2.7	4.5	4.8
25	" "	48	1	2.08	4	8.3	43	6.4	4	2.8	4.8	5.2
26	" "	47	....	....	7	14.9	40	4.3	3	2.9	4.7	5.2
27	W.L. x R.I.R.	48	....	....	4	8.3	44	N/A	N/A	3.0	5.0	5.4
TOTAL		1,289	5*	....	68	....	1,212	....	164	....	....	....
Average		47.59	....	0.39*	....	5.28	45	7.4	6.07	2.8	4.7	5.1

* Excluding four chickens killed accidentally at the time of deworming.

Table B

EGG PRODUCTION AND CARCASS VALUES

Entry	Age at first egg—days	Age to reach 50 per cent. lay—days	Eggs laid by entry in 50 weeks laying period	Eggs laid per bird alive		Eggs laid per bird for 50 weeks on a hen day basis	Average egg price per doz.	Value of eggs laid to end of test, based on W.A. Egg Board gradings on a net return to farmer basis	Value of birds sold at 2s. 1d. per lb. live weight
				(a) at 8 weeks of age	(b) at 18 weeks of age				
1	162	195	9,603	200-0	200-0	201-9	s. d.	£ s. d.	£ s. d.
2	157	193	9,181	191-3	195-3	198-8	3 8-5	148 9 2	22 14 2
3	162	200	9,488	197-6	197-6	198-2	3 7-7	142 9 5	23 11 10
4	161	192	9,522	198-4	198-4	200-5	3 7-5	143 18 11	23 15 0
5	163	196	8,868	192-7	192-7	195-2	3 8-2	143 19 7	23 4 7
6	147	189	9,431	196-5	196-5	200-4	3 7-2	135 19 6	25 10 5
7	158	195	9,132	190-2	190-2	192-3	3 8-6	141 9 9	23 16 0
8	171	197	8,834	184-0	188-0	191-1	3 10-1	141 10 9	24 16 10
9	168	189	9,117	194-0	194-0	197-0	3 7-7	138 8 4	22 19 5
10	180	197	8,785	190-9	190-9	190-9	3 8-3	135 0 8	26 9 2
11	163	195	9,103	189-8	189-8	190-6	3 7-4	137 7 7	22 16 3
12	161	193	8,995	187-4	187-4	189-7	3 7-9	137 0 1	23 15 0
13	153	192	8,873	184-8	184-8	186-6	3 8-6	137 6 5	25 2 1
14	152	198	9,056	188-6	188-6	188-6	3 7-4	136 9 7	23 7 9
15	164	191	8,976	187-0	187-0	191-8	3 7-3	135 9 10	25 1 0
16	168	205	8,718	181-6	181-6	185-5	3 8-2	133 16 9	25 4 2
17	161	193	8,741	182-1	182-1	185-8	3 9-4	137 14 5	25 10 5
18	170	199	7,914	179-9	179-9	190-3	3 8-8	123 4 3	21 13 4
19	168	190	8,636	179-9	179-9	181-1	3 8-4	133 2 8	26 15 5
20	159	193	8,811	183-6	183-6	185-9	3 8-3	135 13 3	25 12 6
21	169	198	8,965	186-8	190-3	194-4	3 6-8	133 5 0	22 18 4
22	166	188	8,639	180-0	180-0	186-4	3 8-9	134 15 10	23 6 8
23	169	195	8,706	181-4	181-4	184-3	3 8-0	132 19 5	25 10 5
24	164	200	8,216	174-9	178-6	184-5	3 8-2	126 2 8	21 10 3
25	160	201	8,389	174-8	178-5	183-2	3 8-0	128 2 11	23 4 7
26	159	195	8,366	178-0	178-0	187-0	3 7-1	125 6 2	21 10 2
27	166	201	8,100	168-8	168-8	176-8	3 8-6	125 10 4	24 15 10
Average	162	195	8,858	186-1	186-8	190-4	3 8-2	135 15 8	23 19 11

Table C
EGG SIZE AND EGG GRADINGS

Entry	Egg Size		Egg Gradings					
	Average egg weight of all eggs laid—oz.	16 lb. Export	14 lb. Export	16 lb. Local	14 lb. Local	12 lb. Local	Second Quality	Rejects
1	2-13	58-9	26-0	5-2	0-1	5-4	4-2	0-2
2	2-14	60-8	24-4	4-5	0-2	6-2	3-4	0-5
3	2-11	57-2	24-9	4-1	0-5	6-8	6-0	0-5
4	2-10	51-3	31-5	3-2	0-5	9-0	4-2	0-3
5	2-12	59-9	23-7	3-3	....	7-1	5-5	0-5
6	2-06	47-2	35-8	2-4	....	10-5	3-4	0-4
7	2-16	59-2	24-4	5-5	....	5-4	5-0	0-5
8	2-19	69-4	17-9	5-7	0-1	3-3	3-2	0-4
9	2-11	53-1	30-1	3-5	....	7-8	5-0	0-5
10	2-14	56-8	26-6	6-3	0-2	5-4	4-6	0-1
11	2-06	50-3	32-9	3-2	0-1	9-1	4-2	0-2
12	2-08	54-5	28-8	3-0	....	7-7	5-6	0-4
13	2-10	56-0	26-4	5-1	0-1	7-6	4-8	....
14	2-08	52-2	31-1	4-0	0-4	8-0	3-9	0-6
15	2-06	52-2	29-0	4-7	0-3	7-3	5-9	0-8
16	2-11	56-2	29-1	2-6	....	7-3	4-0	0-8
17	2-19	64-6	19-7	6-3	0-1	3-4	5-4	0-5
18	2-14	59-9	24-5	5-0	0-1	5-7	4-4	0-4
19	2-15	57-4	25-6	6-0	0-3	7-1	3-3	0-3
20	2-17	62-2	20-4	5-6	0-1	5-6	5-5	0-6
21	2-08	51-4	31-6	2-1	0-1	8-3	6-2	0-3
22	2-13	60-2	24-3	4-5	....	6-1	4-4	0-5
23	2-15	60-0	21-5	4-9	....	7-0	6-2	0-4
24	2-11	56-9	28-6	4-4	....	5-5	4-2	0-4
25	2-09	53-4	31-4	3-4	0-3	7-1	4-2	0-2
26	2-09	51-7	30-6	2-2	0-3	8-7	6-2	0-3
27	2-16	62-6	24-2	3-5	....	4-0	5-6	0-1
Average	2-12	56-8	26-9	4-2	0-1	6-8	4-8	0-4

HIGHEST AND LOWEST EGG PRICES PREVAILING DURING 1958 FOR ABOVE GRADES

Price per dozen on net return to basis	12th May to 11th Aug. to 8th Dec.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
		4 9 ¹ / ₂	4 1	4 7	3 11	3 3	1 5	....
		3 6	2 11	3 4	2 9	2 2	7	....

Table D
FOOD CONSUMPTION

Entry	Weight of food consumed from 8 wks. of age, excluding greenfeed which was fed at the rate of 1½ oz. per bird per day during the laying period	Value of feed consumed from 8 wks. of age	Weight of feed consumed per bird from 18 wks. of age excluding greenfeed	Average food consumption per bird per day during		Feed eaten per doz. eggs laid from 18 wks. of age excluding greenfeed	Feed eaten per lb. of eggs produced from 18 wks. of age excluding greenfeed
				9-18 wks. (10 wk. period)	19-68 wks. (50 wk. laying period)		
	lb.	£ s. d.	lb.	oz.	oz.	lb.	lb.
1	4,839-0	77 13 11	89-3	2-69	4-11	5-34	3-55
2	4,724-2	75 16 10	90-3	2-69	4-13	5-45	3-39
3	4,831-2	77 10 10	88-8	2-65	4-06	5-37	3-39
4	4,826-7	77 9 4	89-4	2-65	4-09	5-35	3-39
5	4,725-5	75 17 9	91-4	2-85	4-18	5-61	3-52
6	4,780-4	76 13 8	88-8	2-85	4-06	5-32	3-45
7	4,913-7	78 17 7	91-2	2-65	4-17	5-69	3-52
8	4,885-9	78 7 10	93-6	2-93	4-27	5-81	3-71
9	4,732-4	75 18 7	89-6	2-85	4-15	5-53	3-49
10	4,993-9	80 3 4	95-7	2-93	4-38	6-01	3-75
11	4,737-5	76 0 11	87-4	2-69	4-00	5-50	3-55
12	4,800-5	77 1 5	89-3	2-69	4-08	5-65	3-61
13	4,883-7	78 17 11	90-5	2-65	4-13	5-82	3-74
14	4,762-5	76 9 0	87-5	2-69	3-99	5-56	3-56
15	4,892-2	78 10 8	92-1	2-65	4-21	5-78	3-72
16	4,829-7	77 10 7	90-3	2-65	4-13	5-85	3-69
17	5,108-5	81 19 8	95-5	2-93	4-37	6-17	3-76
18	4,392-5	70 9 3	92-4	2-85	4-22	5-83	3-63
19	4,928-5	79 1 3	90-4	2-93	4-13	5-99	3-71
20	5,011-0	80 8 1	92-7	2-93	4-24	5-99	3-68
21	4,690-6	75 5 11	89-7	2-69	4-10	5-54	3-52
22	4,840-9	77 13 5	91-6	2-85	4-13	5-89	3-68
23	4,972-0	79 15 4	92-2	2-93	4-21	6-00	3-87
24	4,437-0	71 4 0	87-5	2-63	4-00	5-69	3-59
25	4,648-1	74 11 5	88-9	2-77	4-06	5-82	3-71
26	4,666-9	74 17 2	91-2	2-85	4-17	5-85	3-73
27	4,882-5	78 6 3	93-1	2-93	4-26	6-32	3-90
Average	4,805-1	77 4 2	90-8	2-80	4-15	5-72	3-69

Table E
FINANCIAL SUMMARY OF RESULTS ON A PER BIRD ALIVE AT 8 WEEKS BASIS

Entry	Value of eggs laid	Live weight value at 2s. 1d. per lb.	Income from sale of eggs and birds	Cost of feed from 8 wks.	Profit per bird alive at 8 wks.
	£ s. d.	s. d.	£ s. d.	£ s. d.	£ s. d.
1	3 1 10	9 6	3 11 4	1 12 4	1 19 0
2	2 19 4	9 10	3 9 2	1 11 7	1 17 7*
3	2 19 11	9 11	3 9 10	1 12 3	1 17 7*
4	3 0 0	9 8	3 9 8	1 12 3	1 17 5
5	2 19 1	11 1	3 10 2	1 12 11	1 17 3
6	2 18 11	9 11	3 8 10	1 11 11	1 16 11
7	2 19 0	10 4	3 9 4	1 12 10	1 16 6
8	2 18 11	10 2	3 9 1	1 12 8	1 16 5
9	2 18 11	9 9	3 8 8	1 12 4	1 16 4
10	2 18 8	11 6	3 10 2	1 14 10	1 15 4
11	2 17 3	9 6	3 6 9	1 11 8	1 15 1
12	2 17 1	9 10	3 6 11	1 12 1	1 14 10†
13	2 17 3	10 6	3 7 9	1 12 11	1 14 10†
14	2 16 10	9 9	3 6 7	1 11 10	1 14 9
15	2 16 5	10 5	3 6 10	1 12 8	1 14 2
16	2 15 9	10 6	3 6 3	1 12 3	1 14 0
17	2 17 5	10 7	3 8 0	1 14 2	1 13 10‡
18	2 16 0	9 10	3 5 10	1 12 0	1 13 10‡
19	2 15 5	11 2	3 6 7	1 12 11	1 13 8§
20	2 16 6	10 8	3 7 2	1 13 6	1 13 8§
21	2 15 6	9 6	3 5 0	1 11 4	1 13 8§
22	2 16 2	9 8	3 5 0	1 12 4	1 13 6
23	2 15 5	10 7	3 6 0	1 13 2	1 12 10
24	2 13 8	9 2	3 2 10	1 10 3	1 12 7
25	2 13 5	9 8	3 5 1	1 11 1	1 12 0
26	2 13 4	9 2	3 2 6	1 11 7	1 10 11
27	2 12 3	10 4	3 2 7	1 12 7	1 10 0
Average	2 17 1	10 1	3 7 2	1 12 5	1 14 9

NOTE.—The laying period was the same for all entries covering 350 days.

* Shared 2nd place.

† Shared 12th place.

‡ Shared 17th place.

§ Shared 19th place.

Table F
CAUSES OF DEATH FROM DAY OLD TO 68 WEEKS

Cause of Death	0-8 weeks	9-18 weeks	19-68 weeks
Bluecomb	15	2	....
Caecal Coccidiosis	14	....	....
Intestinal Coccidiosis	5	....	....
Gizzard impaction	9	1	....
Omphalitis	3	....	....
Yolk Sac infection	2	....	....
Diseased liver	1	....	....
Severe eye infection	1	....	....
Respiratory complaints ....	....	1	....
Deworming (accidental) ....	....	4	....
Deformed midgut ....	....	1	....
Unknown	48	....	20
Visceral Leucosis ....	....	....	34
Egg Peritonitis ....	....	....	7
Generalised Peritonitis ....	....	....	1
Pneumonia ....	....	....	1
Urates in Kidneys ....	....	....	1
Internal haemorrhage ....	....	....	1
Protrusion ....	....	....	1
Severe ovarian infection ....	....	....	1
Undeveloped runt ....	....	....	1
TOTAL	98	9	68

NOTE.—

The 98 chicks which died in the 0-8 weeks period represented 6.51 per cent. of the 1,485 chickens taken into the test at day old.

In addition to the 98 chicks which died during the first eight weeks, 13 cockerels (0.88 per cent.) were removed at eight weeks, and 85 pullet chicks were balloted out. This left 1,289 pullet chicks to officially start the test at eight weeks.

Of these 1,289 chickens, nine or 0.7 per cent. died during the 9-18 weeks period and 68 or 5.28 per cent. died during the 19-68 weeks period.

Included in the figure of nine deaths for the 9-18 week old period were four chickens accidentally killed at the time of deworming. These were the only accidental deaths during the currency of the test.

The majority of birds included in the unknown deaths were birds which died during week-ends and which were unsuitable for pathological examination.

HIGH YIELDS FROM BEECHER BARLEY

High yields were obtained with the six row barley variety, Beecher, in Department of Agriculture trials carried out at "Glen Lossie", Kojonup in co-operation with C.S.I.R.O.

Announcing this yesterday the Minister for Agriculture (Mr. C. D. Nalder), said that small barley trials were sown at "Glen Lossie" in 1957 and again in 1958. Average yields for the two seasons were Beecher 53.9 bushels per acre; Atlas 35.1, Maltworthy 34.5 and Prior 33.0. Shedding reduced the yields for Atlas and Prior.

Mr. Nalder said that the excellent yields obtained with Beecher indicates that it is a suitable variety for sowing in the Great Southern districts, despite its early maturity. However, for best results it is advisable to sow it as late in the season as possible, to lessen the danger of frost damage and the occurrence of weather-stained kernels.



PADDY MELON

(Cucumis myriocarpus Naud)

During the summer, rock melons and water melons are popular, but several members of the same family of plants have proved troublesome weeds. Paddy melon and Afghan melon occur freely in a number of districts, particularly on fallow and in moist depressions.

WEEDS of Western Australia

By **G.R.W. MEADLY** M.Sc.

Officer in Charge, Weeds and Seeds Branch

PADDY MELON

(*Cucumis myriocarpus* Naud.)

THE mention of melons brings to mind the many edible types that are cultivated, both for stock food and human consumption. The pig or pie melon is often fed to animals, and is also used for the making of jam, while the related water melon and the smaller rock or musk melon are popular and palatable summer fruits.

The melon group, however, is not an entirely unmixed blessing and several species have become troublesome weeds, besides having some harmful properties. A small variety of the common pie melon has become gregarious, especially in the Meenar and Grass Valley districts, where it occurs mainly on fallowed land. In that area it is known as wild or Afghan melon and is stated to have been introduced by Afghans about 50 years ago. The fruit resembles a miniature pie melon, being 3 to 5 in. in diameter. It is an annual vine, growing in the spring and summer.

The Colycynth melon, a plant very similar in appearance, was recorded at Townsville, Queensland in 1926, and some 20 years later in South Australia. So far it has not been found in this State. The Colycynth has a fruit similar in size to the Afghan melon, but has more conspicuous pale markings on the rind. It also differs in being a perennial, the taproot being hard, woody and conspicuous, 2 to 6 in. in diameter, and often more than 3 ft. in length.

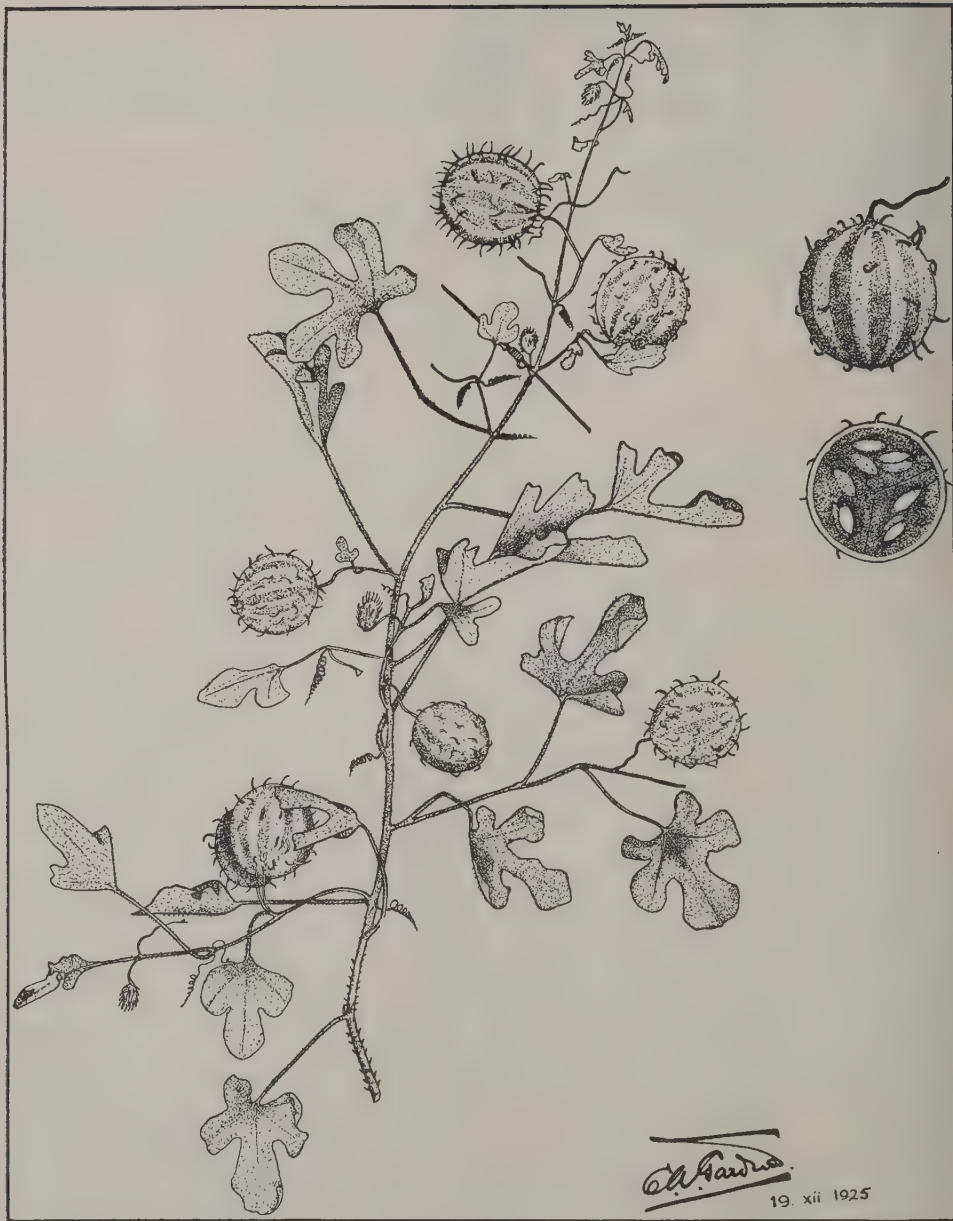
Sheep are reported to eat the fruits of both the Afghan and Colycynth melons, when more attractive forage is not available, and no doubt both plants are spread in this manner. When eaten in quantity, the Colycynth is said to be poisonous, and the dried pulp of the fruit is known to

have a purgative action. On occasions the Afghan melon has also been suspected of having toxic properties.

A third member of the melon group which must be classed as a weed in Australia, is the Paddy Melon (*Cucumis myriocarpus*), a plant which is more closely related to the cucumber than the pie melon. It is native to South Africa but is now established in Queensland, New South Wales, Victoria, South Australia and Western Australia. In this State it has been recorded from various localities, including Walkaway, Walgoolan, Pinjarra, Bridgetown and Dwellingup, and as with the Afghan melon, is most vigorous on soils which are moist during the summer, showing a preference for fallowed land.

DESCRIPTION

Paddy Melon is a prostrate annual herb with slender, rough stems. The ovate cordate leaves are 1 to 2½ in. long, with five rounded, toothed lobes, the middle one being the longest. They are almost hairless above, but rough and hairy below, with a stout rough stalk about as long as the blade. The male flowers are in clusters of 2-4 on short, slender stalks in the axils of the leaves. The female flowers are formed singly or two together, the ovary having rather distant bristles. The fruit is nearly globular, about one inch in diameter,



PADDY MELON
(*Cucumis myriocarpus* Naud.)

Showing growth habit of plant, also single fruit and cross-section of fruit showing seeds
(From a drawing by C. A. Gardner, Government Botanist)

covered with long soft bristles and marked with longitudinal stripes, dark green at first, but finally yellow. The seeds are oblong, pale yellow and up to one sixth of an inch in length.

SIGNIFICANCE

Besides being a keen competitor for summer crops, Paddy Melon has other undesirable features, mainly associated with its effect on stock. On a number of occasions, particularly in New South Wales, losses of horses, sheep and cattle have been attributed to eating the melons. The plant is suspected of causing blindness in horses but, from time to time, other classes of stock presumably have been affected. With feeding tests the material has proved unpalatable and no positive results have been obtained. Paddy Melon has not been incriminated as a cause of poisoning in Western Australia and it would appear that there is no substantial risk unless this plant is eaten in considerable quantity.

CONTROL

Being an annual, prevention of seeding is the primary consideration in its control. If only a few plants are present, these should be destroyed by pulling or hoeing before melons have formed. More extensive infestations can be handled by cultivation, but, because of the erosion hazard, working of the land during the summer months, when the Paddy Melon occurs, is usually undesirable.

The plants are susceptible to 2,4-D, 1 lb. acid equivalent per acre being sufficient and low-volume treatments being effective. As with grubbing, both cultivation and spraying should be undertaken before the melons develop.

Reference has been made to the fact that Paddy Melon favours places which retain moisture during the summer, being found most freely on fallowed land and along water courses. As the melons are carried readily by running water and the associated conditions are favourable for their growth, particular attention should be given to creeks and moist flats.

FOOTROT CONTROL

Encouraging results in the control of footrot in sheep had been obtained during the current season, said the Chief Veterinary Surgeon of the Department of Agriculture, (Mr. C. R. Toop) recently.

There are at present only 28 flocks in Western Australia under footrot quarantine restrictions and ten of these, on which the slaughter of affected sheep is pending, are expected to be released within the next few weeks. Most of the remainder are small flocks which should not present any serious difficulties in achieving eradication.

The Geraldton district was freed from footrot about four years ago and has remained free. The disease has since been eradicated in the Moora, Narrogin-Williams and Katanning-Kojonup stock inspection districts and it is expected that only two affected properties will remain in the Albany-Mt. Barker area when releases now pending are put into effect. Affected flocks in the Bridgetown-Boyup Brook-Manjimup area have been reduced from about 170 to four, of which two flocks contain less than 100 sheep.

Mount Manypeaks

The Mount Manypeaks area, where extremely severe outbreaks of footrot have occurred during the past three years, is now virtually free from

the disease. One property is still under quarantine as a precautionary measure but is believed to be free from infection.

Mr. Toop said that on three Mount Manypeaks properties a vast amount of control work had been carried out for three years without achieving eradication. Finally it was decided to sell these flocks for slaughter and to restock them with "clean" sheep.

For a fortnight after the paddocks had been supposedly cleared of sheep, stragglers continued to emerge, from swamps and thickets. As such stragglers would almost certainly be badly-infected animals, their presence would seem to explain the earlier failures.

While it was possible that there were still a few infected flocks not yet discovered, said Mr. Toop, the footrot position today was brighter than ever before in the State's history.

A disease which had caused serious economic loss to the industry for many years was now reduced to negligible proportions, and in view of the progress achieved during the past few years there appeared to be some justification for hopes of total eradication of footrot from West Australian flocks in the fairly near future.

This could only be achieved however, if farmers continued to remain "footrot-conscious" and maintained unending vigilance to ensure that no re-infection of flocks took place.

1839



1959

A POST OFFICE system of a kind has existed for centuries, but after the introduction of railways, postal administration assumed special magnitude.

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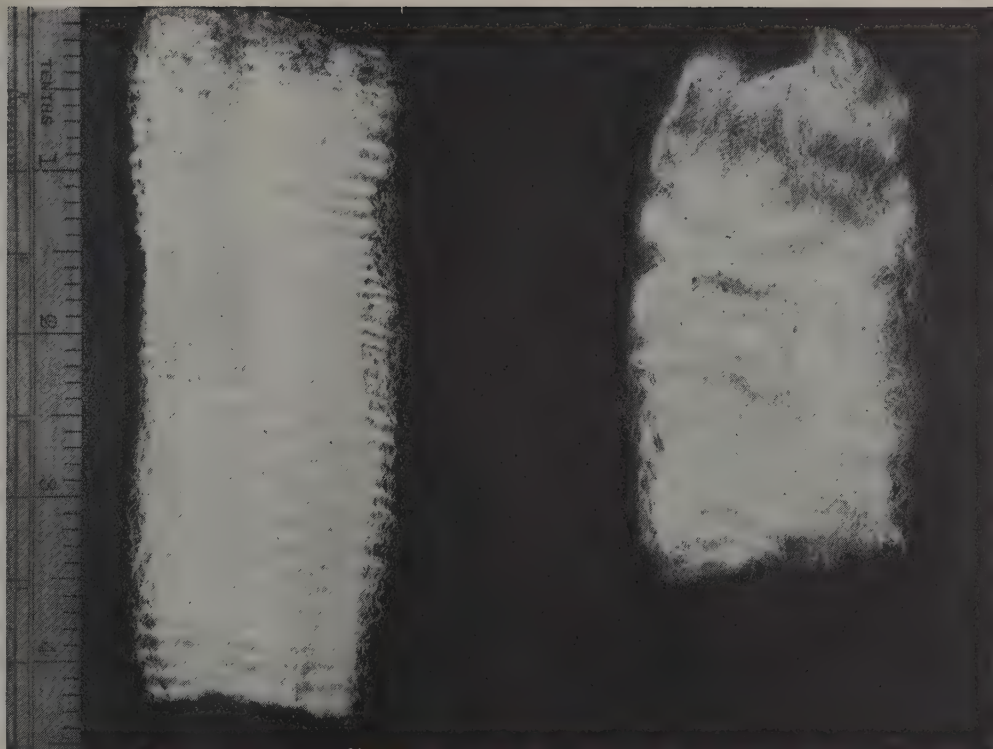


Fig. 1.—Merino wool—strong type. That on the left shows good style. That on the right lacks style

Classing Your Own Clip

By W. L. McGARRY, Officer-in-Charge, Sheep and Wool Section, and
J. REILLY, Sheep and Wool Instructor

WITH the steep decline in wool prices, the need to reduce production costs has become of prime importance and one way farmers can reduce costs is to class their own clips. Classing their own clips improves growers' wool knowledge, and equips them to cull and to select rams more efficiently, in addition to achieving a direct saving of classing costs.

The classing of farmers' clips to the best financial advantage is a task that can be performed capably by growers who take an intelligent interest in their sheep and the wool they produce. Classing of such clips calls mainly for the matching of similar fleeces into as few and as big lines as possible out of which must be kept the irregular or "outsort" fleeces which do not match the main lines. The main qualifica-

tions required in the correct matching of fleeces are common-sense and good eyesight allied to adequate shed facilities.

The Sheep and Wool Section of the Department conducts Wool-Classing Refresher Schools in various districts prior to shearing each year. Farmers are recommended to attend these schools which are of direct assistance when they are classing their own clips.

SHEARING SHED FACILITIES

A roomy, well-designed shed is essential if shearing and classing are to be carried out efficiently and expeditiously. Shed space must be laid out economically to ensure the most efficient handling of sheep and wool, and in planning the wool room, it is necessary to aim at a quick, clean handling of the fleeces. It is a great advantage to have the wool travelling in the one direction towards the press.

LIGHTING

The question of light is **very important**, particularly in view of the fact that a good deal of shearing is done when days are short and often cloudy.

Good lighting is essential if the clip is to be classed to the best financial advantage, and in addition it enables the classing to be carried out quickly and easily. Although some improvement is noticeable in recent years, many shearing sheds in farming areas are still insufficiently lighted to class wool properly. Lighting is frequently overlooked or ignored by many farmers when constructing their sheds or when arranging their sheds in preparation for shearing. They are not doing justice to their clips or their pockets in preparing their wool for market in a poor light and then subjecting it to the "acid test" of display and valuation under the excellent natural lighting of a wool showfloor.

Some methods of improving the lighting of shearing sheds are:—

- (1) Installation of saw-tooth type of roofs.
- (2) Installation of skylights.
- (3) Whitewashing the inside walls and roofs of sheds. This will improve the lighting considerably at a small cost.
- (4) Temporary removal of a few sheets of iron from a suitable position during shearing—be careful to avoid sun-glare, however.
- (5) Rearrangement of pens, wool bins, wool tables and shearing board, so that the available light can be used to the best advantage.
- (6) Replacing the galvanised iron or board sides of wool bins with wire-netting or battens.

WOOL BINS

It is necessary to have at least six bins in the average farmer's flock of 1,000 to 1,500 sheep. In larger flocks, more bins are necessary and, in the rush of shearing, more bins mean better classing, more convenience, less work and less double handling.

WOOL TABLES

An adequate wool-rolling table is indispensable if the preparation of the fleece for classing is to be done efficiently and expeditiously. The work involved on the wool-rolling table is most important, because it is at this stage that the initial, and probably most serious faults occur in the "get-up" of the clip. Half the classing is done if the skirting, backing and rolling is correctly and quickly carried out, and the provision of an adequate wool-rolling table is absolutely essential if efficiency and speed in fleece preparation are to be achieved.

Good work is possible only on a table of satisfactory dimensions, and wool-rolling tables should have sufficient length and width to accommodate a fleece that lies flat without it over-hanging the sides or ends of the table.

The minimum length and width of a wool rolling table should be 10 ft. x 5 ft. with battens spaced $\frac{3}{4}$ in. to 1 in. apart. It is definitely preferable to have a table a little on the large side than to have one on the small side. Many tables in use today are too small for good work and could be enlarged to an adequate size at little cost with extensions in the form of flooring boards, or additional battens fixed to the sides and/or ends. Tables 3 ft. high are ideal for persons of average height.

ESTABLISHING THE LINES

The decision as to how the clip is to be classed, what lines to make, etc., has to be made during the first day's shearing, and the importance of the first day's work in setting the lines correctly—or laying the correct foundation on which to class—cannot be over-emphasised. The most difficult part of classing any clip is during the first day, when it is necessary to set out or match together a few fleeces into those lines or grades which are warranted and which are sufficient to cater for the whole clip. It is necessary for the fleeces

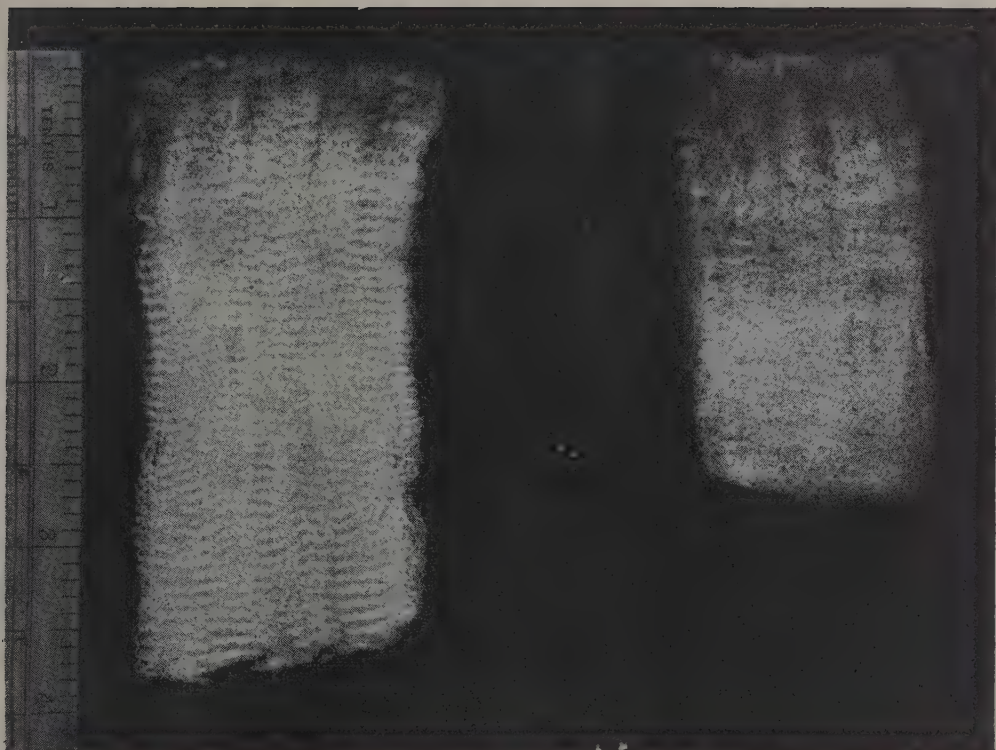


Fig. 2.—Merino wool—medium type. Note difference between the good style on the left and the poor style on the right

in these grades to be sufficiently even so that they will blend profitably as a line, and the number of grades or lines must be few enough to enable reasonably big lines to be made in the clip.

It is recommended that the main objective during the first day's shearing should be "to get the eye in" to enable the correct setting-up of the lines to be made. Time spent in this direction is well spent and will eliminate irregular and unprofitable classing as shearing progresses.

Before setting the lines it is a definite advantage to get the "feel" of the clip first by stacking the first 40 or 50 fleeces in a corner of the shed or in a spare bin as they are shorn—after an examination and handling on the wool-rolling and classing tables. These fleeces can be classed out later when the lines have been made. Having a good "look" at the wool in this way before establishing the lines, assists in a correct appraisal of the average quality and type of the wool to follow and assists

to "get the eye in" quickly to the correct matching of the next 30 to 40 fleeces into the established main lines which will absorb the majority of the clip. Becoming familiar with the wool in this way at the outset eliminates much uncertainty and changing of fleeces afterwards when the lines are being established.

An alternative method is to place 30 to 50 fleeces (according to space available) on the wool room floor, handling and examining them during the skirting and rolling. At a convenient time—no interruptions likely—compare the rolled fleeces for length, quality, colour, soundness, etc., examining them and moving from one to another until the picture of the main lines is clearly in mind. Having established the major lines the others come more easily.

MATCHING

Woolclassing is only another name for the matching into lines of fleeces that are similar in length, quality, condition and



Fig. 3.—Some wool samples showing comparisons

soundness, and naturally fleeces that are similar in these characteristics will go together. Matching will be carried out more quickly and more accurately if the classer observes the "Golden rule" of all wool work, and remembers that first impressions are the best.

QUALITY

Quality refers to the thickness of the fibre (counts). Merino qualities or counts used are:—

Type.	Quality or Count.
Fine	70's
Medium	64's
Strong	60's
Extra strong	58's

Do not be concerned with the figures or counts when classing, but be guided by the crimp formation and general appearance and think and class in terms of fine, medium, strong and extra strong wool. Narrow crimping denotes fineness and broad crimping, strength, or thicker fibres.

Extra strong fleeces should be kept out of the strong lines. If there is not enough for a bale or line, these types should be baled with other "outsort" fleeces into a mixed bale and sent to a broker for bulk classing.

DOGGY FLEECES

Doggy wool is illustrated in Fig. 3. This objectionable and nondescript type of wool is straight-fibred, characterless and shiny, lacking in breeding and with poor felting and spinning properties.

Keep doggy fleeces out of all fleece lines and include with other outsort fleeces in a mixed bale for bulk classing.

OUTSORT FLEECES

Outsort fleeces embrace all irregular, inferior and odd fleeces which will not match the main lines; the value of which is lowered if they are put in. Outsort fleeces include the matted, very discoloured, doggy, heavy black-tipped, rotten, extra strong, heavy and fatty, very short types, etc.

All outsort fleeces should be baled together and sent to brokers for bulk classing.

BULK CLASSING

The bulk classing departments in brokers' stores are designed to handle outsort fleeces to the best financial advantage. Bulk classing was instituted principally to deal with mixed bales, light-weights and bags, which previously were bought by dealers, usually at a discount.

Many bins are used in order to cover all types and colours of wool and, from a mixed bale, possibly a dozen different sorts are made—the owner being credited with the weight which has gone into each of the different bins.

Large lines of bulk-classed wool meet with good competition at sales and provide the medium for growers' small and irregular lots to enjoy full competition and realise full value.

LENGTH

This refers to the average length of the staple and when classing merino wool it is necessary to think and class in terms of:—

Good Length $3\frac{1}{2}$ in. to 4 in. (Warp).

Medium Length $2\frac{1}{2}$ in. to 3 in. (Half Warp).

Short, Under $2\frac{1}{2}$ in. (French Combing).

In years when seasonal conditions are good, warps (main top lines) naturally will be plentiful. However, when the clip is not well grown all the wool will be correspondingly shorter in staple and the half-warps would be the main top line.

CONDITION

This refers to the amount of yolk, etc., in the wool and it is necessary to differentiate between light, medium and heavy variations in condition. When classing, it is necessary to lift the fleece off the classing table to arrive at a reliable estimation of its condition. Do not be misled by colour when estimating condition. A bright fleece is not always light-conditioned and a fleece that is "off colour" (not bright) is not always heavy-conditioned.

All fleeces with a pronounced heavy black tip and heavy fatty fleeces must be kept separate and not included in the medium-conditioned lines.

When wool buyers estimate the amount of condition, they give the line a "yield"—so much percentage clean wool after extraction of grease, dust, etc. To give buyers

the opportunity to base the yield correctly exclude all over-conditioned wools from the main lines.

SOUNDNESS

This refers to the tensile strength of the fibre which is subjected to tension during the combing process. This strain is about equal to a 7 lb. tension on the average staple of wool. Sound wool will withstand this approximate 7 lb. pressure when applied by hand. Unsound or tender wool will give or break under the strain. Inconsistency and errors of judgment will occur when testing wool for soundness, unless the same tension is applied to the same thickness of staple for each fleece.

To test for soundness, grasp the **tip** of staple between the thumb and forefinger of the left hand and the **butt** of the staple between the same fingers of the right hand, being careful not to hold over a break and apply a steady pressure of about 7 lbs. Keep all tender fleeces out of the main sound lines. If there are not enough tender fleeces for a bale or a line, bag them or make a mixed bale with other "outsort" fleeces for the bulk class.

If the big majority of the fleeces in a clip are tender, ignore this factor and class on quality, length and condition.

PICKING UP AND THROWING

If the fleeces are picked up and thrown correctly, the whole "get-up" will benefit because the fleeces can be skirted much more efficiently and expeditiously when they are thrown so that they lie flat on the table.

A little time and trouble spent by the picker-up in this important aspect of shed work is reflected in better work and better classing throughout the shed. **A little attention to straightening and disentangling the points of a fleece** as the shearer is finishing the last few blows can, and does often, mean the difference between good and bad throwing, and consequently good and bad skirting and backing.

Frequent use of the broom should be made by the picker-up to avoid dags, second cuts, sweaty ends, etc., from the previously shorn sheep being gathered into the fleece as it is picked up.

A fleece should not be thrown too vigorously onto the wool table, but rather

easily propelled or "floated" on. A little practice in good throwing (floating) does away with the troublesome broken fleece.

SKIRTING AND BACKING

Maximum returns are dependent upon efficient skirting and it is essential that fleeces are carefully skirted for sweat, stain, seed and burr, and also any rough breech pieces. Discretion must be used as to the depth or amount of skirting necessary. The volume of skirtings removed can vary with seasonal conditions, which govern the amount of seed and/or burr, dust and foreign matter in a fleece.

Careless or faulty work at the wool-rolling table can result in overskirting, which is definitely unprofitable. Overskirting builds up the piece lines at the expense of the more valuable fleece lines—in other words, it increases the quantity of lower-priced wool and decreases the quantity of higher-priced wool.

When skirting, it is recommended that all breech skirtings be thrown in a basket handy at the end of the table; separate from the rest of the skirtings. This will facilitate piece-picking, in that any rough breech skirts and stains are automatically separated from the rest of the pieces.

Those portions of the back and neck wool which are too thin, short, dusty, etc., to



Fig. 4.—Tender wool. Note break when subjected to tension

match the rest of the fleece, should be removed, an inspection on the rolling table with the tip side up is essential to determine the degree of backing necessary. Indiscriminate removal of backs and necks is unprofitable and results in much wool which could have been typed as fleece, being relegated to a broken type at a lower value. Profitable classing calls for as much fleece wool in a clip as possible.

When backs are removed and a line is made, this wool must be kept separate and branded BKN MO.

WOOL-ROLLING

Neat, compact, well-rolled fleeces with the **shoulder** wool wrapped around the fleece have definite advantages lacking in slovenly and carelessly-rolled fleeces. These advantages are:—

- (1) The wool opens up more attractively on the showfloor.
- (2) Handling is facilitated when carrying to the bin and when pressing.
- (3) **A greater degree of consistency and evenness** in the classing and better distinction between the lines is facilitated.

Rolling should be done by folding in one-third of the fleece lengthways, then fold the doubled portion to the outer edge. Then roll firmly but not too tightly from the breech to the neck.

PIECES AND BELLIES

Pieces and belly lines in all clips should be free of urine stains, second cuts and locks. It is not necessary to make more than one line of pieces and bellies in **small** clips, but in larger clips two lines can be made if sufficient labour is available.

Very heavily seeded pieces and matted jowls should be kept out of all piece lines. Bag separately if not enough for a bale.

Pieces should be shaken thoroughly to eliminate locks and second cuts. Piece lines that are locky will go down in type, yield and value.

LOCKS AND STAINS

The stained piece line should take only urine and dung stains from the breech end of fleeces, together with belly pizzle stains. Dry all stains before pressing. If the stained content is heavy due to lack of

crutching, lush season, etc., breech skirtings should be trimmed carefully, because the presence of over much clean wool in stained piece lines is unprofitable, and, conversely, clean piece lines containing stains will be reduced in value as a result of this fault.

Locks should be shaken in order to eliminate dags and pieces. The inclusion of dags results in the paying of freight on something that is worthless, and the pieces will bring more money if included in the piece line.

LAMBS

Only one line should be made in small clips, but where warranted, two lines can be made for larger clips—grading Merino lambs for length and aiming at a good distinction. Remove all urine and dung stains.

DOWNS TYPE OF WOOL

As most of the Downs wool types carry brown, black or grey fibres, it is important that it is not mixed with any other wool. Wool of this type should be branded according to breed and bagged if there is insufficient for a bale. Where growers of fat lambs of the Downs breeds have a number of unfinished lambs left on their hands that are shorn at the general shearing, the wool when shorn should be kept strictly apart from other wool, and placed into bales or bags without skirting.

NUMBER OF LINES TO MAKE

The number of lines made is dependent upon the size of the flock and the amount of wool to be handled. Lines as big as possible should be made and overclassing should be avoided. Experience indicates that a few big lines of fleece wool that are reasonably even, are more profitable than a number of small lines. In these main lines, the top fleeces "carry" the average fleeces with the result that generally a higher average price per lb. results than if the wool had been classed out closely into smaller and probably more uniform lines.

To receive full advantage of classing in this manner, however, great care must be taken to keep out of the main lines the odd irregular fleeces that do not match.

When setting or establishing the lines, do not set the standard of the top lines too high, set the standard according to the wool before you and not on the previous year's clip and have a good distinction between the tops and seconds. Make plenty of top line even if it is not as good as you would like—the second line will, by comparison, be correspondingly inferior in appearance and lower in value if the lines have been soundly established. Big top lines are not possible if the standard is set too high at the commencement of shearing. Big top lines are profitable and increase the average price per lb. over the whole clip.

The average price per lb. is more important than the individual price per lb. for various lines, and it is the important factor as far as total cash returns are concerned.

BORDERLINE FLEECES

While a big top line is very desirable, farmers often force odd **"too-strong-for-the-line"** fleeces up into their medium-fine top line thus detracting from the value of their otherwise good work. The offending fleeces are usually quite attractive ones

but of **strong** quality and their lower quality is generally indicated by a **wider crimp**. Inclusion of such fleeces lowers the price per lb. of the whole top line.

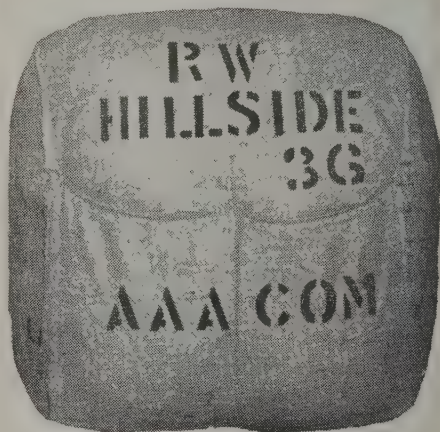


Fig. 6.—Cap of a correctly-branded bale

Always put these **"borderline-for-quality"** fleeces in the B lines. Borderliners, being stronger than the average quality of the medium-fine lines, will lower their value but being finer than the stronger lines will improve their values.

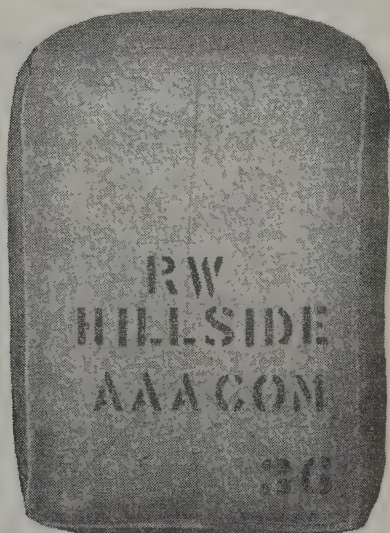


Fig. 5.—Side view of a correctly-branded bale

BIG, INTER AND STAR LOTS

Brokers' showfloors are arranged in several sections and **five and over** bales of any one line constitute a **"big lot"** and will be offered as a complete line in the **"big lot"** section. The **"interlot"** section is for a line that is **under** five bales and is suitable to combine with a line or lines from other growers making up a sizable offering. A **"starlot"** is a line of **under** five bales, that is not suitable for interlotting and so is placed in the **"star lot"** section as an individual offering.

BALE WEIGHTS

The minimum weight of a bale of greasy wool (other than lambs' wool) is **250 lb.** Bales weighing less than this are generally treated by brokers through their bulk-class department. The minimum weight of a bale of greasy lambs is **220 lbs.**

CLASSER'S REPORT

It is most essential that the classer or grower sends the wool broker a brief report on the clip, immediately shearing is finished, giving the bale number of any "splits" in the flock and stating where and at what bale number a change has

occurred in the wool. This could occur through a change in country, a different paddock, or a change of flock during shearing.

This report assists brokers considerably in displaying and cataloguing clips to the best advantage prior to sale.

STANDARD BALE MARKINGS

DESCRPTIONS as recommended and approved by this Department and all wool organisations. The new branding system has been well received and practically all growers have used the new descriptions.

To assist classers in general the new and old markings are shown opposite each other.

New Marking:	Old Marking:
AAA M	AAA COM
AA M	AA COM
A M	A COM
AAA COM	AAA
AA COM	AA
A COM	A
BBB	BBB COM
BB	BB COM
BBB COM	BBB
EB COM	BB
B COM	B
COM	COM
AAA BKN MO	AAA MO
AAA NKS	AAA BKN

DESCRIPTION OF LINES FOR MERINO FLOCKS OF OVER 1,500 GROWN SHEEP

Lines can be made from the following descriptions:—

Because a description is shown it does not necessarily follow that every clip has wool, or wool in sufficient quantity, to fit this description, and it can therefore be eliminated if considered advisable.

Brand—

AAA M	Good length, sound, light condition, finest quality of clip.
AA M	Shorter, sound, heavier in condition, finest quality of clip.
A M	Very short and heavy in condition, finest quality of clip.
AAA COM	Good length, sound, light condition, medium quality of clip.
AA COM	Shorter, sound, heavier in condition, medium quality of clip.
A COM	Very short, sound, heavier in condition, medium quality of clip.

BBB	Good length, sound, light condition, strong quality of clip. (Exclude extra strong, straight-fibred and doggy fleeces.)
BB	Shorter, sound, heavier in condition, strong quality of clip. (Exclude extra strong, straight-fibred and doggy fleeces.)
BBB COM	Attractive fleeces of extra strong quality . (Keep straight-fibred and doggy fleeces out.)
BB COM	Shorter, sound, heavier in condition, extra strong quality . (Exclude straight-fibred and doggy fleeces.)
B COM	Rough and doggy fleeces if sufficient to make a bale otherwise into COM B/C.
AAA FLC	Tender, average to good length, medium and fine quality . (Extra strong, straight-fibred and doggy out to COM B/C).
AA FLC	Tender, shorter and heavier, medium and fine quality . (Extra strong, straight-fibred and doggy out to COM B/C).
BBB FLC	Tender, strong quality . (Exclude doggy fleeces.)
COM B/C	Takes all inferior and irregular fleeces that will not match the main lines. (See notes on outsort fleeces.) Bale fleeces together into a mixed bale and consign to broker for bulk classing. Most of these fleeces will come from culls and it will make classing easier if the culls are drafted off and shorn separately. (It is essential to make this line in every clip.)
AAA BKN MO	Fine and medium quality backs and necks fairly free of vegetable fault.

BBB BKN MO	(If warranted.) Strong quality backs, fairly free.	BBB	Good length, sound, light to medium condition, strong quality. (Exclude extra strong, straight-fibred and doggy fleeces.)
AAA NKS	Fine and medium quality necks containing vegetable fault.	AAA FLC	Tender. Contains all fleeces out of previous three lines that are tender. Exclude extra strong, straight-fibred and doggy fleeces.)
BBB NKS	(If warranted.) Strong quality necks containing vegetable fault.	COM B/C	Takes all inferior and irregular fleeces that will not match the previous four lines. (See notes on outsort fleeces.) Bale fleeces together into a mixed bale and consign to broker for bulk classing. Most of these fleeces will come from culls and it will make classing easier if the culls are drafted off and shorn separately.
AAA PCS	Longest and lightest pieces. Stains removed. Keep heavily seeded pieces and matted jowls out and brand SDY PCS. Keep locks out of pieces.		<i>(It is essential to make this line in every clip.)</i>
AA PCS	Shorter and heavier.	AAA BKN MO	Best of backs and necks fairly free of vegetable fault.
BBB PCS	Contains rough quality pieces and breech ends.	AAA NKS	(Only if warranted.) Similar to above but containing heavy vegetable fault.
STD PCS	One line. Dags removed. Contains only urine and dung-stained pieces. Dry before pressing.	AAA PCS	Longest and lightest pieces. Stains removed. Keep heavily seeded pieces and matted jowls out and brand them SDY PCS. Keep locks out of pieces.
AAA LKS	Lightest and brightest (table locks) dags and stains removed. Keep out pieces.	AA PCS	Shorter and heavier (only if warranted.)
AA LKS	Board locks (if warranted.) Dags and stains removed. Keep pieces out of locks.	AAA BLS	One line. Pizzle and surrounding stains removed.
AAA BLS	Longest and lightest. Remove pizzle and surrounding stains and trim lightly .	STD PCS	One line. Dags removed. Contains only urine and dung stained pieces. Dry before pressing.
AA BLS	Shorter and heavier. Remove pizzle and surrounding stains.	LKS	One line. Dags removed. Keep pieces out of locks.
AAA LBS	Longest and lightest. Stains removed.	AAA LBS	Longest and lightest. Stains removed.
AA LBS	Shorter and heavier. Stains removed. Odd fleeces from rough, hairy-tipped and late-dropped lambs (very short) to be blended through with LKS.	AA LBS	Shorter and heavier. (If warranted). Stains removed. Odd fleeces from rough hairy-tipped and late-dropped lambs (very short) to be blended through with LKS.
AAA CRT	Longest and lightest crutchings. Remove stains and dags. Do not mix with crutchings held over from previous crutching.	CRT	Crutchings. One line minus dags. Do not mix with crutchings held over from previous crutching.
AA CRT	Shorter and heavier crutchings. Remove dags.		

MERINO FLOCKS OF UP TO 1,500 GROWN SHEEP

Lines can be made from the following descriptions:—

Because a description is shown it does not necessarily follow that every clip has wool, or wool in sufficient quantity, to fit this description, and it can therefore be eliminated if considered advisable. Extra lines can be made where warranted—Depending upon size of flock (see descriptions for over 1,500 grown sheep).

Brand—

AAA M	Good length, sound, light condition, fine to medium quality.
AA M	Shorter, sound, heavier in condition, fine to medium quality.

COMEBACK AND CROSSBRED FLOCKS

It is stressed that in classing crossbred wool, quality or fibre thickness, is the most important factor to keep in mind.

Crossbreds are graded and described as follows:—

Type	Brand		
Comeback	CBK (Finest)	AA MXB	Shorter and heavier, medium crossbred wool.
Fine Crossbred	F XB (Fine crossbred)	CXB	Good length, light to medium condition, all coarse crossbred wool and long British breeds.
Medium Crossbred	M XB (Medium crossbred)		
Coarse Crossbred	C XB (Coarse crossbred)		
In mixed flocks, i.e., crossbred and merino, classing will be more efficient and made much easier if the sheep are drafted in the yards before shearing and shorn separately.			
Lines can be made from the following descriptions:—			
<i>Because a description is shown it does not necessarily follow that every clip has wool, or wool in sufficient quantity, to fit this description and it can therefore be eliminated if considered advisable.</i>			
Brand—			
AAA CBK	Good length, light to medium condition, comeback (finest) wool.	AAA CBK FLC	Tender comebacks.
AA CBK	Shorter and heavier in condition, comeback (finest) wool.	AAA XB FLC	Tender crossbreds.
AAA FXB	Good length, light to medium condition, fine crossbred wool.	CBK PCS	Comeback and fine crossbred pieces.
AA FXB	Shorter and heavier fine crossbred wool.	XB PCS	Medium and strong crossbred pieces.
AAA MXB	Good length, light to medium condition, medium crossbred wool.	CBK BLS	Comeback and fine crossbred bellies.
		XB BLS	Medium and strong crossbred bellies.
		XB STD PCS	One line, CBK and XB stains together, minus dags and dry before pressing.
		XB LKS	One line, CBK and XB locks minus dags.
		CBK LBS	Comeback (finest) lambs (two lines if necessary, according to length.)
		FM XB LBS	Fine and medium crossbred lambs (two lines if necessary, according to length.)
		XB LBS	Coarse crossbred lambs.

CERTIFICATION OF CURRIE COCKSFOOT

The Minister for Agriculture has advised that the Currie strain of cocksfoot has now been included in the seed certification scheme operated by the Department of Agriculture. The first pedigree seed was harvested at the Wokalup Research Station in February and pastures established from this seed, if they meet certain other requirements, will be eligible for the production of certified permanent pasture seed.

This strain was introduced to Western Australia in 1950 when a small quantity of seed was made available by the C.S.I.R.O. Plant Introduction Division to the Department of Agriculture. Under trial at the Wokalup Research Station it proved to be well adapted for local conditions. Currie is easier to establish than other strains of cocksfoot, makes good winter growth, persists well under grazing and becomes dormant during the summer. The seed does not differ in appearance from other strains but the florets do not break up readily, making cleaning and grading more difficult.

Certification will enable farmers to be certain they obtain the Currie strain with a satisfactory pure seed content and germination. In general principle the scheme will be the same as that for subterranean clover but will differ in some details owing to the risk of cross-pollination. Also it is not possible to separate the strains with certainty, either during the growing period or from the seeds themselves.

This means that there must be a supply of base or pedigree seed from which pastures are sown for the harvesting of standard seed—the seed with which the farmer establishes his grazing pasture. The pedigree seed crop must also be isolated from other strains of cocksfoot to eliminate the risk of cross-pollination.

Farmers who intend sowing pedigree seed for the purpose of harvesting certified standard seed should ascertain the conditions of certification from the Department of Agriculture. Application forms are available from the Department and should be returned before August 20th each year.

ALWAYS BUY

Western Australian

DRIED FRUITS



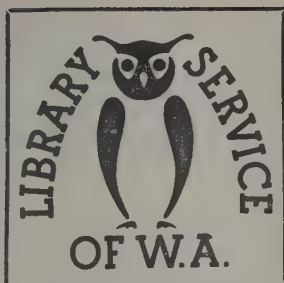
**ORANGE,
FRUIT
and
NUT LOAF**

Ingredients:

- 3 oz. butter or margarine.
- $\frac{3}{4}$ cup sugar.
- 2 eggs.
- 2 cups plain flour.
- Pinch salt.
- 1 lev. teaspoon bi-carbonate soda.
- $\frac{1}{4}$ cup warm water.
- 1 cup sultanas or raisins.
- $\frac{1}{2}$ cup mixed nuts.
- 1 whole small orange.
- Few drops vanilla.

METHOD.

Cream the margarine and add the sugar and vanilla. Add the beaten eggs, mixing well. Cut the washed, unpeeled orange in halves, remove the centre pith and the seeds. Put through a mincer with the sultanas or raisins. Add to the creamed mixture with the nuts. Fold in the sifted flour and salt alternatively with the water in which the soda has been dissolved. Place in two greased nut loaf tins and bake in a moderate oven 374 deg. F. gas; 425 deg. F. elec. for one hour. Allow to stand 10 minutes before removing from the tin.



BOOKS...

for FARMERS

THE following books on agriculture, recently published and obtainable to order from most booksellers, have been added to the stock of the Library Board of W.A. and may be borrowed freely from any public library associated with the Board, or consulted at the State Library of Western Australia.

GENERAL

AGRICULTURAL BOTANY, by N. T. Gill and K. C. Vear. Lond., 1958.

APPLICATIONS OF ATOMIC SCIENCE IN AGRICULTURE AND FOOD. Report of Mission to the United States sponsored by the European Productivity Agency of the Organisation for European Economic Co-operation. Paris, 1958.

FLOWERING TREES IN INDIA, by M. S. Randhawa. New Delhi, 1957.

THE GEOGRAPHICAL BASIS OF GOVERNMENT SPECIALLY APPLIED TO NEW SOUTH WALES, by J. M. Holmes, Syd., 1944. The purpose of this book is to show that . . . in the regional approach there is an opportunity to establish in rural Australia the fuller life now characteristic of its capital cities. Preface.

AN INTRODUCTION TO TROPICAL AGRICULTURE, by Sir H. A. Temperley and D. H. Grist, Lond., 1958.

FARM MANAGEMENT

FARM MANAGEMENT IN THE UNITED STATES. Report by a group of experts to the European Productivity Agency of the Organisation for European Economic Co-operation. Paris, 1958.

AGRICULTURAL MACHINERY

DIRECTORY OF AGRICULTURAL MACHINERY AND EQUIPMENT MANUFACTURERS AND DISTRIBUTORS. Compiled by the Division of Agricultural Production of the Commonwealth Department of Primary Industry. [4th Ed.]. Canb., 1958.

ELECTRICITY IN AGRICULTURAL ENGINEERING, by T. E. Hinton, D. E. Wiant and O. E. Brown. N.Y., 1958.

SOILS AND FERTILISERS

FERTILISERS FOR THE FARM AND GARDEN, by L. J. H. Teakle and R. A. Boyle. Syd., 1958.

FUNDAMENTALS OF SOIL SCIENCE, by C. E. Millar, L. M. Turk and H. D. Foth. 3rd Ed. N.Y., 1958.

SOIL. The Yearbook of Agriculture, 1957. Compiled by the Yearbook Committee of the United States Department of Agriculture, Washington (D.C.), [1957].

TRACE ELEMENTS. Proceedings of the Conference held at the Ohio Agricultural Experiment Station, Wooster, Ohio in 1957. Edited by C. A. Lamb, O. G. Bentley and J. M. Beattie. N.Y., 1958.

IRRIGATION

DRAINAGE OF AGRICULTURAL LANDS. Ed. by J. N. Luthin. Madison (Wis.), 1957.

TRANSACTIONS OF THE 3rd CONGRESS ON IRRIGATION AND DRAINAGE. Held in San Francisco, 1957. New Delhi, [1958?].

DISEASES AND PESTS

CONTROL OF PESTS IN STORED AGRICULTURAL PRODUCTS WITH SPECIAL REFERENCE TO GRAIN. Report of a survey in North and South America and certain Mediterranean countries in

1954 and 1955. Made for the European Productivity Agency of the Organisation for European Economic Co-operation. Paris, 1958.

PROCEEDINGS OF THE CONFERENCE OF COMMONWEALTH AND STATE ENTOMOLOGISTS. Brisbane, 1957. Melb., 1958.

PROCEEDINGS OF THE CONFERENCE ON BROWN ROT OF STONE FRUITS. Burnley, Victoria, 1956. Melb., 1958.

FIELD CROPS

FIVE HUNDRED VARIETIES OF HERBAGE AND FODDER PLANTS. Ed. by M. Hall. Aberystwyth (Wales), [1943].

FRUIT GROWING

CATALOGUE OF THE TYPES AND SIZES OF WOODEN PACKAGING FOR FRUIT AND VEGETABLES USED IN EUROPE. Issued by the European Productivity Agency of the Organisation for European Economic Co-operation. Paris, 1958.

FORESTRY

BRITISH COMMONWEALTH FOREST TERMINOLOGY. Issued by the Empire Forestry Association. Lond., 1953-57.

LIVESTOCK

COMPARATIVE NUTRITION OF FARM ANIMALS, by H. R. Guilbert and J. K. Loosli. Prepared for the Committee on Animal Nutrition of the Agricultural Board of the National Research Council. Washington (D.C.), 1951.

THE FLUOROSIS PROBLEM IN LIVESTOCK PRODUCTION. A report of the Committee on Animal Nutrition prepared by the Subcommittee on Fluorosis Problems of the National Research Council. Washington (D.C.), 1955.

INTRODUCTORY ANIMAL HUSBANDRY, by A. L. Anderson. 3rd Ed. N.Y., 1958.

NUTRIENT REQUIREMENTS FOR DOMESTIC ANIMALS. A report of the Committee on Animal Health, Agricultural Board, of the National Research Council. Numbers 1-9. Washington (D.C.), 1949-1958.

THE PIG INDUSTRY. Incorporating the Australian Stud Pig Breeders' Directory. Ed. by W. Deutsch. [2nd Ed.]. Syd., 1944.

PREGNANCY DIAGNOSIS TESTS. A review by A. T. Cowe. Edin., 1948.

A REVIEW OF BLOAT IN RUMINANTS. A report of the Committee on Animal Health of the Agricultural Board, National Research Council, prepared by a Subcommittee on Bloat. [Rev. Ed.]. 1956.

SHEEP, by L. J. Horlacher and C. Hammonds. Danville (Ill.), 1950.

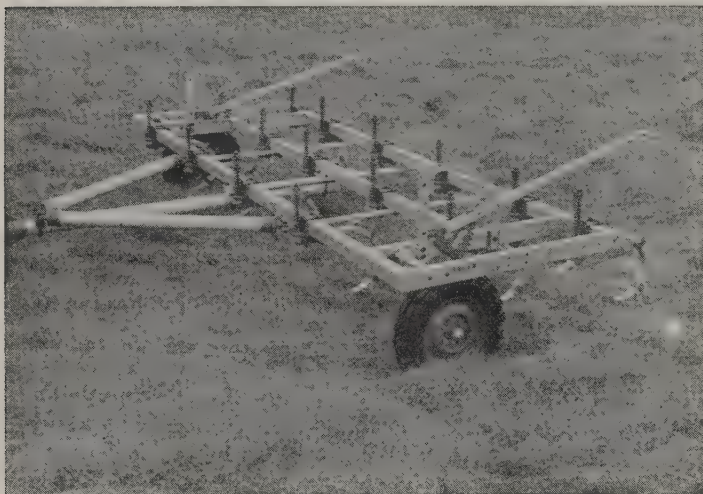
DAIRYING

DAIRY CATTLE BREEDING IN THE TROPICS, by P. Mahadevan. Farnham Royal (Bucks.), 1958.

PRECEPT AND PRACTICE ON NORTH COAST DAIRY FARMS, by H. Fallding. Syd., 1958.

THE THREE ESSENTIALS

for healthy and vigorous plant growth

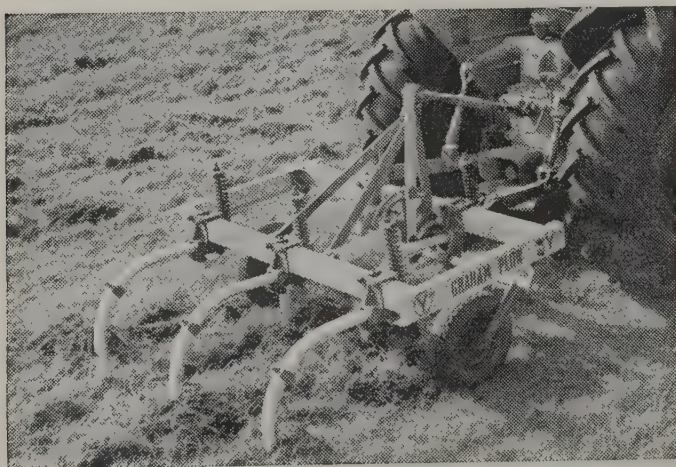


air
moisture
warmth

At left: Model
N14' Trailing
Plow.

The three essentials for healthy and vigorous plant growth are brought together in near perfect balance by the intelligent use of the Graham Chisel Plow.

The Graham is designed with a correct scientific regard for the requirements of soil development and water conservation. We will demonstrate a Graham Plow on your own property free of any obligation, making available to you valuable knowledge gained from six years of practical work in W.A. with a Graham . . . the genuine Chisel Plow.



At left: Model E5'
Linkage Plow.

CONTACT

Elders

or

**MODERN TILLAGE
BEVERLEY**

Weed Research...



by **G. A. PEARCE B. Sc. (Agric)**
BOTANIST, WEEDS & SEEDS BRANCH.

3.—Weed Control in Onions

COMPETITION from weeds has always been one of the greatest obstacles in producing a large and profitable onion crop. Even though inter-row cultivation is possible, hand weeding within the row is always necessary and this operation may cost as much as £30 per acre for the season. The use of a chemical for weed control in onions would not only reduce the labour involved but would mean that individual growers could handle larger areas.

Trials in this State have been undertaken since 1952. Reports from the United States in 1955 stimulated this work and satisfactory results have been obtained with chemicals during the past two years. Good results have also been obtained in Victoria and Tasmania in recent years using the same chemical.

EFFECTIVE CHEMICALS

Chloro I.P.C. (isoprophyl-n-(3 chlorophenyl) carbamate) and C.M.U. (3-p-chlorophenyl-1, 1-dimethylurea) have given effective weed control for a period of 8 to 14 weeks. However C.M.U. caused a reduction in yield and as it is difficult to apply evenly, its general use is not recommended.

Chloro I.P.C. is most effective when acting against weeds in the very young seedling or germinating stage. Best results are obtained if the chemical is applied to a clean soil surface immediately after planting the seed, seedlings or dry set bulbs. Chloro I.P.C. penetrates the surface of the soil so that seed planted to a depth of one inch or more is unlikely to be affected. The downward movement of the chemical is more likely in light sandy soils than in heavy soils.

RATE OF APPLICATION

At the rate of 4 lb. Chloro I.P.C. per acre, 7 fluid ounces of 30 per cent. (or 4 fluid ounces 50 per cent.) Chloro I.P.C. in 3 gallons water is sufficient to treat 160 square yards.

1. **Seed.**—Where the crop is planted by seed, Chloro I.P.C. should be only used on heavier type soils at the rate of 4 lb. per acre. With sandy soils there is a strong risk of a reduced germination of onion seed due to the movement of the chemical to the level of planting. Because of this risk an application of power kerosene at the rate of 40-50 gallons per acre is preferred. With both Chloro I.P.C. and kerosene the spraying should be undertaken two to three days before the onion seedlings emerge.

2. **Seedlings.**—Planted out seedlings should be sprayed within three to four days of planting. At this time the plants are not making active growth so that the risk of damage is minimised. Chloro I.P.C. can be applied to the crop at 4 lb. per acre either on light or heavy soils.

3. **Dry Set Bulbs.**—These emerge much slower than seed so that the application of the chemical can be safely delayed. Best results will be obtained if the crop is



Fig. 1.—General layout of onion trial at Bornholm. The chemicals were applied one day after the seedlings were transplanted

sprayed at the first sign of any weed emergence. The recommended rate of application is 4 lb. per acre.

FURTHER SPRAYING

The initial treatment with Chloro I.P.C. should give effective control for a period of 8 to 14 weeks. A further spraying can be applied without damaging the onions and this should be undertaken at the first appearance of a general weed emergence. A rate of 4 lb. Chloro I.P.C. per acre should be used.

WEEDS CONTROLLED

Under local conditions good control of the following weeds has been obtained—Stagger Weed (*Stachys arvensis*), seedling Docks (*Rumex* spp.), Fumitory (*Fumaria capreolata*), Wimmera ryegrass (*Lolium rigidum*), Winter grass (*Poa annua*), Pigweed (*Portulaca oleracea*) and Burr medic (*Medicago denticulata*).

Most perennial weeds are resistant to this treatment and other annual weeds may also be more difficult to control.

Fig. 2.—*Fumaria* controlled with 4 lb. Chloro I.P.C. per acre



Fig. 3.—General view of onion trial at Dardanup. The chemicals were applied one day after the seedlings were transplanted



METHOD OF APPLICATION

To obtain best results it is essential to make an even application of the chemical to the soil. In W.A., individual onion plantings are not usually large. For this reason most spraying can be undertaken with knapsack spray. A convenient volume of spray would therefore be 100 gallons per acre. At the 4 lb. rate of application, 7 fluid ounces of 30 per cent. Chloro I.P.C. (or 4 fluid ounces of 50 per cent.) dissolved in one knapsack of water is sufficient to treat 160 square yards.

The bed should be disturbed as little as possible after the treatment is applied

as a fresh germination can be expected once the soil surface is broken. For this reason the whole area should be sprayed rather than small strips along the rows.

COSTS OF TREATMENTS

Chloro I.P.C. is a liquid and can be obtained as proprietary lines from a number of commercial firms. The cost will vary according to the concentration contained; however, it is in the vicinity of 40s. per lb. of Chloro I.P.C. This means that it will cost approximately 5s. to treat 160 square yards of crop. No more than two or three sprayings are likely to be required in one



Fig. 4.—The plot on the left received C.M.U. at the rate of 2 lb. per acre. However, the onion yield was markedly reduced with this treatment



Fig. 5.—The plot on the right received Chloro I.P.C. at the rate of 4 lb. per acre. The yield of onions was not reduced

season so that this cost compares more than favourably with inter-row cultivation and hand weeding.

SUMMARY

1. Trials undertaken under local conditions have given good control of weeds in onion crops. Similar results have been obtained in other States in the last few years.

2. On sandy soils, Chloro I.P.C. should not be applied to areas planted by seed until the plants have at least reached the "hook" stage.

3. On heavier soils, Chloro I.P.C. can be applied to areas planted with seed, the first treatment being applied a few days before the onion seedlings emerge.

4. Planted out seedlings or dry set bulbs can be treated with Chloro I.P.C. immediately

after planting whether growing on heavy or light soils.

5. Well established onion plants can be safely sprayed with Chloro I.P.C. A second treatment should be applied at the first sign of a general emergence of weeds.

6. Rate of Application.—The standard rate used should be 4 lb. Chloro I.P.C. per acre. A crop planted by seed on light sandy soil should not be sprayed unless the onions are in the "hook" stage.

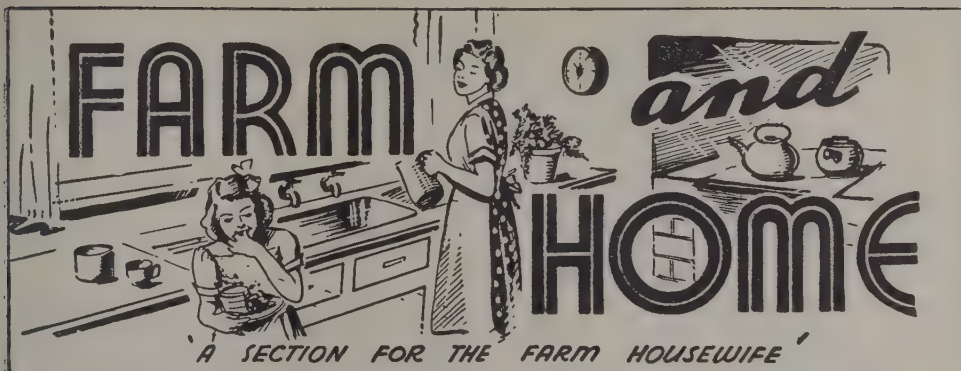
7. Most winter-growing annuals including Stagger weed, seedling Docks, Fumitory, Ryegrass, Pigweed and Winter grass have been controlled.

8. Using 4 lb. Chloro I.P.C. per acre the cost of treating 160 square yards is approximately 5s.

FARMERS

This is YOUR Journal, and it has been written, edited and presented in a sincere endeavour to give you helpful information in an interesting manner.

We would like to have your views on the Journal—to know whether you like it or whether you don't. Drop a line to the editor and tell him the features you like and don't like in this issue—or the features you hope to see in future issues.



A TASTY POULTRY DISH

By HELEN M. GLOSTER.

EVEN an elderly "boiler" can provide a tasty and enjoyable dish if cooked "en casserole." A further advantage of this method, which will appeal to the party hostess, is that all preparations can be completed well before the arrival of the guests so that a minimum of time and effort is required for serving.

Ingredients.

To each lb. of boiling fowl allow—
 1 rasher of bacon or some pieces of chopped ham.
 1 small onion or a few shallots (with stalks).
 1 tablespoon chopped parsley.
 1 little grated lemon rind.
 Pepper, salt, pinch of mace.
 3 level tablespoons flour.
 Stock, vegetable water or water.
 $\frac{1}{2}$ teaspoon mixed herbs (if liked).
 (A tomato may also be added).

Method.

1. Place flour, flavourings and seasoning in a casserole and blend with liquid.
2. Dice onion and bacon, stir into casserole mixture.
3. Joint the fowl and cut into convenient serving portions.
4. Stir all ingredients well together.
5. Put lid on casserole and cook slowly in oven for about 3 hours or until poultry is tender.

Do not use too much liquid in casserole.

6. Serve with baked jacket potatoes and green peas, or other green vegetables.

A yellow vegetable should also be served with this dish.

BAKED JACKET POTATOES

Select well-shaped tubes from old potatoes, one for each serving portion.

Wash and scrub well.

Prick well all over.

Grease by rubbing with a used butter paper.

Place in oven $1\frac{1}{2}$ to 2 hours before serving. Test with a skewer.

To Serve.

Cut through skin on top of potato in the shape of a cross.

Squeeze the potato and the cooked floury potato will fluff between the cut skin.

Add a small piece of butter to each potato and sprinkle with salt and pepper.

Sprinkle a little chopped parsley on top or decorate with a fresh mint leaf.

VEGETABLE WATER

This is the water in which root or green vegetables have been cooked. **Don't** throw this water down the sink. It contains minerals, vitamins and flavourings which have been extracted from the vegetables. Save all vegetable water. It may be kept in the refrigerator by placing in a jar with a lid.

Use vegetable water when making soups, stews and gravies. It will give added flavour and nourishment.

Simply-made Accessories for the Ball Frock

WITH the dancing season here again, the question of finding suitable accessories for ball frocks is causing many frowns. Why not make this attractive stole and handbag set? It will solve the problem of finding accessories to tone in with your new frock or alternatively will help give the "new look" to one that has already given good service.

The set illustrated was made from $2\frac{1}{2}$ yds. of shot taffeta. Apart from the material used, you will need a dozen rings (brass curtain rings or coloured plastic rings); a reel of sewing silk to match the material; some lengths of thick knitting



wool; a 6 in. x 8 in. piece of strawboard such as the lid of a cardboard box, and some suitable fringe.

The Handbag.

Make this first, cutting the material as economically as possible and using the remainder for the stole.



Cut paper patterns—one a $5\frac{1}{2}$ in. x $7\frac{1}{2}$ in. oval, the other a long strip $7\frac{1}{2}$ in. wide and 24 in. long, or more if the material allows.

Cut two oval pieces of material, allowing for turnings, and cut the strawboard oval (used to stiffen the bottom of the bag) the exact size of the pattern.

Place ends of long strip together and machine, then open out and press flat. Join one of the sides of the long material to one of the ovals, easing the long piece where necessary so that the oval is the exact size of the strawboard oval.

Turn the bag to the wrong side and place the second piece of oval material over the strawboard base, turn in the edges and pin into position, then neatly hand-hem the turned-in edge to the base of the bag.

Turn the bag to the right side and turn a hem (1½ in. wide when finished) at the top of the bag. Machine the hem, then attach the 12 rings at equally-spaced intervals along the machine-line on the inside of the bag. The rings may be covered with crochet if desired.

For the handle, take a strip of material 1½ in. wide, from selvedge to selvedge of the main piece of material. Care must be taken not to cut into the main length of material when doing this.

Fold the strip double with the right side inward and machine the edges together to make a tube. Turn to bring the right side outward, then pad the tube by threading through a number of strands of thick knitting wool. Thread the handle tube twice through the rings and then join the ends neatly together.

The Stole.

Take the remainder of the material and see that the ends are trimmed straight. Fringe the ends to any desired depth (about 3 in. makes a good fringe).

Fold with right side inward and selvedges together and join by machining, press the join and turn to the right side.

ESPERANCE PLAINS PROGRESS

Although the original development of the Esperance coastal plain was mainly related to wool and meat production, it is now evident that there are good prospects of grain becoming an important addition to the farming economy of the area, especially as Esperance is a natural port for the export of cereal grains.

This was stressed recently by the Minister for Agriculture, (Mr. C. D. Nalder), in releasing reports of results achieved at the Esperance Plains Research Station.

He pointed out that it is less than ten years since the area was taken over as an undeveloped block. The first pastures and experiments were sown in 1950 and the sown areas were increased to the present 1,140 acres over the following six years.

Procedures used at the Station were the same as those recommended to farmers for the development of the plain country and in the main were based on subterranean clover—Wimmera ryegrass pastures. Superphosphate has been applied at the rate of 150 lb. per acre with copper and zinc being used in the first year.

The stock-carrying capacity of the property has now reached the stage where 2,200 sheep, of which two-thirds are mated ewes, and 75 head of beef cattle are being maintained. The pasture growth of the past season was sufficient to enable 100 tons of pasture hay to be conserved.

In the 1958 season, 145 acres of pasture were ploughed for the cropping and experimental programme. Oats constituted the main crops and 53 bushels per acre were harvested. The portion cut for hay produced 117 tons from 47 acres. A small area of wheat yielded 24 bushels per acre. Barley was not included in last season's cropping but has been grown successfully in previous years.

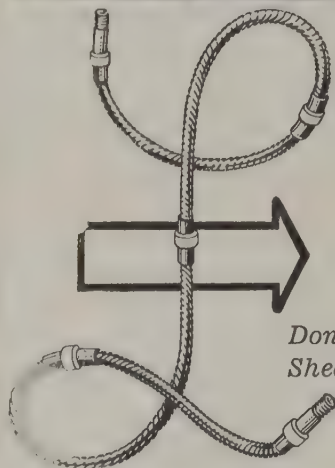
Trials with linseed and flax were also of interest. A small area of linseed yielded about 16 bushels per acre of seed. Flax yields were high but the fibre obtained was coarse and of poor quality. Further investigations of both these crops is needed before their value can be determined.

The yields of the 1958 season demonstrated very emphatically the improvement in the fertility of the soil which results from the annual pastures used as the basis for stock-raising, and which makes it so suitable for subsequent cropping.

Mr. Nalder concluded by saying that if there were ever any doubts concerning the productive capacity of the Esperance district the results obtained on the research station constituted a convincing reply. Admittedly, he said, the season had been a very good one but it had previously been shown that with normal farming practices, including fodder conservation, there was no difficulty in maintaining stock numbers from year to year and in producing high grade wool, lambs and cattle.

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Shearing-breakdown - - fit COREMASTER.*

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COREMASTER ELIMINATES BREAK-DOWNS.—Coremaster is a metallic flexible shafting with nylon bushes, replaces gut and green hide cores in the down tube of shearing machines. Not only does nylon reduce noise, it is extremely wear resistant.

CANNOT BE DAMAGED.—If drive is mistakenly reversed the Coremaster cannot unwind, the hooks and bayonet fittings will merely unscrew.

COREMASTERS are available for Cooper, Cooper Conversion; Worsley and Lister overhead and Electric Shearing Machines.

EASY REPLACEMENTS.—Metal threads at ends of Coremaster enables hook and bayonet fittings to be replaced merely by unscrewing; more reliable method than pins used on the conventional cores.

LONGER LIFE.—After accelerated tests equivalent to 25 years' shearing, Coremaster drives show no sign of wear. They are treated with rust preventative and are rodent proof. Ten years' guarantee.

FASTER SHEARING.—As there is no loss of R.P.M. (the older core drops 200 R.P.M. on the long blow). This means faster shearing with the same effort. An improvement of 10 per cent. can be expected.

Obtainable at your Local Storekeeper or—

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PLANT DISEASES

PEACH LEAF CURL

By W. P. CASS SMITH, Government Plant Pathologist

PEACH leaf curl caused by the fungus *Taphrina deformans* is a very common disease in this State during the spring and early summer. In addition to attacking both edible and flowering peaches, the fungus also attacks nectarines, and very occasionally apricots. When preventive measures are neglected the disease may be anticipated yearly commencing in spring.

Leaf Curl infection is most obvious on the leaves which become enlarged, thickened, blistered and greatly distorted. The whole of a leaf may be affected but generally only portions are attacked.

The curled portions turn yellow with a pink tinge and may become a deep red, and a whitish bloom covers the surface. Finally, the affected leaves turn brown and fall, so that when the attack is severe, heavy defoliation occurs. In this State new leaves which develop following this defoliation generally remain healthy and by December the trees appear quite normal. However, when through neglect to control the disease, defoliation occurs each year, the trees are seriously weakened.

Shoot and fruit infection may also occur but are less common than leaf infection. Shoots become stunted, curved and more or less distorted when affected with disease, and the terminal bud generally dies. Fruit infection, with us, is noted more frequently on nectarines than peaches and shows as red, irregular, blistered areas which give the appearance of early ripening.

CONTROL OF PEACH LEAF CURL

Fortunately Leaf Curl is easily controlled. In fact it responds to treatment more readily than any other important disease of fruit trees. One thorough spraying with Bordeaux mixture (6-4-50) +

Peach leaves affected with Leaf Curl disease.



calcium caseinate spreader at any time during the dormant period is effective. When applied in autumn at leaf fall, this spray gives excellent control of Leaf Curl and it also helps to control the more serious Shot Hole disease.

In home gardens, copper oxychloride, which is easier to prepare, may be used

instead of Bordeaux mixture but it is not generally so effective.

If for any reason preventive spraying is not carried out, and the leaves of peaches or nectarines actually become infected, little can be done to control the disease until the next season, as secondary infections are uncommon in this State.

FRIESIANS BREAK RECORD

Two Friesian cows owned by Mr. L. A. Jackman of North Dandalup, have broken the existing junior two year old Western Australian Friesian record for butterfat production.

The previous record was held by "Riverdale Dutch Inka" owned by Mr. L. Pensini, with a production of 14,805 lb. Milk, 3.4% test and 507 lb. butterfat.

Mr. Jackman's "Dandala Delphine Jewel" broke the record when she completed her test of 11,907 lb. Milk, 4.3% test and 509 lb. butterfat in a 300 day lactation. Her dam is "Dandala Marshal's Delphine."

In the following month Dandala Marshal's "Delilah", a half-sister to "Jewel" then broke Jewel's record with a production of 13,560 lb. Milk, 3.8% test and 514 lb. butterfat in 300 days.

Delilah's dam is "Dandala Transvaal Deidre" and the sire of both of the cows is "Murray Glen Transvaal Field Marshal."

A notable feature of these performances is that the lactations were completed in the months of January and February.



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INSECT *Pests* AND THEIR CONTROL

By G. D. RIMES, B.Sc., Entomologist

THE BARK BEETLE IN WEST AUSTRALIAN PINE FORESTS

THE bark beetle, *Ips grandicollis* Eichh. (Coleoptera, Scolytidae) has been known in metropolitan pine plantations for the last ten years. It was first recorded in Australia from the South Australian pine plantations (Brimblecombe 1953). Although the mechanical damage caused by these beetles is not very serious, they introduce a wood-staining fungus, and cause a degree of desiccation, which has an adverse effect upon the commercial value of the logs when marketed to the plywood industry.

DESCRIPTION

The adult beetle varies in colour from light brown in its freshly emerged state, to dark brown in its later life. It ranges in size from 3 to 4 m.m. and is readily recognised by the presence of five tooth-like spines on each side of its posterior end.

ADULT HABITAT

Under local conditions the bark beetle is only concerned with felled trees, slash material, dead limbs and tops, and dying trees.

Although in North America *Ips grandicollis* is known to attack living trees, chiefly the trunks of saplings and larger limbs of mature trees, observations carried out in West Australian forests have failed to reveal this type of damage.

Standing trees were attacked in the Scaddan plantation following the fires in 1957. These trees were fire-damaged and the incidence of *Ips* attack fell rapidly as the distance from the fire boundary increased. Attack was also observed in lightning-struck trees in the Mundaring plantation.

The normal beetle population exists in the slash material formed during thinning operations. Where thinning has been

carried out during the summer period a large population rapidly develops. A minimum log size of approximately three inches in diameter, appears necessary to provide the correct physiological factors attractive to the adult. Thickly-barked logs are not attractive.

The first evidence of attack is the appearance of yellow or reddish boring dust in the bark crevices, or small piles of dust on the ground beneath the entrance holes. Pitch tubes are not formed and the boring dust is free from pitch. Once entry is gained to the inner bark, the characteristic tunnelling is commenced at the junction of the bark and sapwood. In a highly infested log the bark is readily detachable, the junction of inner bark to sapwood having been destroyed. This results in desiccation of the log. Upon removal of the bark the pattern of tunnels is clearly shown as an etching in the sapwood.

LIFE HISTORY

The adult male initiates the attack by boring a nuptial chamber several times his size in the inner bark. He is then joined by several females, the number varying slightly but usually being five. Following fertilisation the females construct egg gai-



A typical logging scene. Note slash material in foreground

leries, which are slightly meandering tunnels radiating from the central nuptial chamber. The basic pattern is a typical radiate gallery. The females deposit eggs in niches on the sides of these galleries. On hatching the larvae begin mining at right angles to the parent gallery. Upon maturation a pupal chamber is formed and metamorphosis occurs. The freshly hatched adults bore to the outside of the log making an exit hole. During peak summer activity the life cycle occupies from four to five weeks.

During a typical season *Ips* activity extends from September until May, resulting in about six generations per season. During the mild winter conditions existing in this region larvae will overwinter, but the main overwintering stage is the adult which remains beneath the bark of suitable logs.

CONTROL METHODS

As the major breeding habitat of *Ips* is slash material, any attempt at slash destruction would result in a general fall in the *Ips* population.

As a time-lag of some 24-48 hours exists after felling before a log becomes attractive to the insect, prompt removal from the forests will provide an acceptable log at the plywood factories. However, a population reservoir exists at these sites which makes some type of insecticidal protection desirable.

Chemical Control.

Experiments were carried out during the period 1956 to 1959 in an endeavour to obtain a substance which would provide economic log protection. Any proposal for eradication was not possible due to the extensive distribution of the insect.

The chemicals to be tested were applied with a power spray to piles of millable logs, there being approximately 20 in each pile. The ends of the piles were well sprayed,



Ips activity in the inner bark of a pine log

material passing completely through the length of the pile. One load of peeler logs (50 cub. ft.) would receive two gallons of insecticide. At the end of the two-month test period the bark was carefully removed from the centre foot of each log and the numbers of *Ips* holes counted. The sample area of each log was chosen at random in early trials, but some factor, probably phloem moisture, made this sampling invalid. The piles were formed from freshly-cut logs in an area with a high *Ips* population, and the insecticide was applied on the day of cutting. One pile was used for each insecticidal concentration, untreated piles being left as controls.

The following materials were tested as one per cent water emulsions:—chlorthane, dieldrin, lindane, endrin, aldrin, B.H.C., and diazinon. DDT was tested as a 2 per cent. water emulsion.

Pentachlorophenol was used as a 2 per cent. kerosene solution. A commercial creosote preparation was tested.

Orthodichlorobenzene in dieselene at the rate of one part to six, and ethylene dibromide at the rate of 1½ lb. to 5 gals. of dieselene were tried. A water emulsion of ethylene dibromide was also tested.

From the above compounds lindane and endrin were selected for further concentration tests. A water emulsion of 0.3 per cent. lindane was found to give log protection for a period of two months. A water emulsion of 0.5 per cent. endrin gave protection for a similar period. The lindane treatment was more economical, resulting in an insecticidal cost of 3s. per load of peeler logs, whereas the endrin treatment cost 6s.

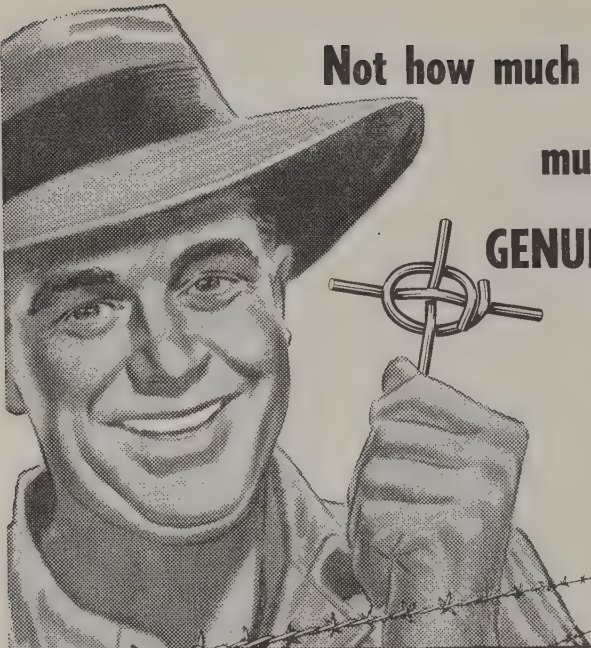
During the 1958-59 season, thiodan and the Shell Chemical W.L. 1650 were tested as 0.5 per cent. water emulsions. Thiodan gave only slightly inferior protection to the 0.3 per cent. lindane treatments, but costs of this material are not available at this date.

SUMMARY

1. In West Australian pine forests *Ips grandicollis* has not been found attacking healthy pine trees.
2. The main breeding habitat is fresh slash material and recently felled logs.
3. There is continuous activity from September until May, the life-cycle occupying four to five weeks, there being approximately six generations per year.
4. Removal of the logs within 48 hours of felling will provide uninfested logs.
5. Chemical protection of logs for a period of two months can be obtained by spraying with a 0.3 per cent. water emulsion of lindane.

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Kikuyu Renovation Points for Tyne Cultivators

By A. L. HAMILTON, Dairy Instructor.

FARMERS throughout the South-West have been faced with the problem of finding a method for renovating paddocks which have been established with kikuyu grass and paspalum over a long period. Both these grasses tend to produce a dense root-bound turf of varying depth which is very difficult to manage with conventional implements. If incompletely grazed, particularly during spring and early summer, kikuyu will form a dense spongy mass as much as three to four inches deep above the ground which effectively prevents the growth of all other species and considerably reduces the vigour of the grass.

Marked success in maintaining kikuyu pastures in vigorous condition has been obtained over many years on J. A. & S. V. Nilsson's property at Margaret River with the use of a small combine.

This machine was originally purchased for sowing oats and pasture seeds, and in order to increase its usefulness it was fitted with a set of "tickler" points, which are hard steel points approximately $\frac{1}{4}$ in. in width. Adapted in this way the machine proved a valuable asset in maintaining an open and aerated condition in the kikuyu sward without leaving the surface in an unduly rough condition. An additional advantage with this type of machine is its ability to sow ryegrass, clover seeds, and fertiliser into the soil at the time of renovation.

Other methods which have been used in the past, are:—

- (a) Burning to remove some of the fibrous cover and produce a fresh growth. This practice is dangerous as the fire is difficult to control and can smoulder for days to burst into flame again with a hot atmosphere and freshening wind. In addition organic matter valuable to plant life is lost in the burn.
- (b) Renovation with rotary tyne cultivators such as the "Sunprong."
- (c) Rotary hoeing to a depth of 2 to 3 in.

- (d) Ploughing and working down with discs across the ploughing.

Disc cultivators, even when heavily weighted, will not cut through a heavy mat, and have the additional disadvantage that they cultivate too deeply on portions of the paddock where kikuyu or paspalum is thin.

Renovation with some of the implements mentioned above requires a more powerful tractor than most farmers have at their disposal and perhaps one of the biggest drawbacks is the fact that the paddock is often left in a very rough condition as the root-bound clods which are brought to the surface are difficult to break down. It is for this reason that many farmers are loth to attempt rejuvenation of these paddocks in which kikuyu has been growing unchecked for perhaps over thirty years.

TILLER POINTS ADAPTED

An adaptation to a tiller point which has been developed in the Busselton district by Mr. T. George of Messrs. Nicholls and Phelps of Busselton appears to offer the best method of renovating these kikuyu and paspalum areas.

The standard tiller points which are used for cultivation are two inches wide, and the power required to pull a nine-tyne tiller through a heavy kikuyu or paspalum sward is considerable. It has also been found that large turfs are pulled up as the points



Fig. 1

reach the soil under the grass mat and the broad point tends to lift as well as tear through the sward.

In order to overcome this difficulty a steel plate was welded at right angles to the centre line on the standard point and the leading edge of the plate was sharpened to act as a knife or "fixed coulter" to slice through the turf. Two different points were developed as illustrated in the accompanying photographs.

Fig. 1. shows a point in which the coulter comprises a section of $\frac{1}{8}$ in. steel cut from a circular saw fitted to a tyne used on a "curly tyne" type of tiller.

In Fig. 2. the coulter is $\frac{3}{8}$ in. steel, the point of which is carried beyond the standard fitting by approximately three inches.

It is fitted to a tyne of the six-foot Ferguson tiller which incorporates spring tension on the tynes.

These points when used on either type of tiller have the effect of slicing a track through the turf to allow the passage of the broad section of the point without unduly disturbing the grass on the surface. The soil underneath is shaken up by the 2 in. wide tyne to a distance of 2 to 3 in. on either side of the cut, thus providing good aeration.

SPACINGS

The spacing of the tynes on the tool-bar of the machines in this area which have been fitted with these points has been maintained at approximately 9 in., thus a little under two-thirds of the soil is shaken up and a little over one-third is left undisturbed. The proportion of the soil which is shaken up could be increased by crossing with the implement but when this is carried out there is a tendency for 9 in. square clods to be torn up on the second run at right angles to the first. A better method of accomplishing a more drastic treatment would be to close the spacings in to say 7 in. and cultivate in one direction only. This would have the effect of reducing the width of the run but it is not feasible to add further tynes than stated below as the draft would be considerably increased and a more powerful tractor would be required.

POWER REQUIREMENTS

In order to indicate the power required it could be stated that an early model Ferguson (TE 20) could successfully pull five tynes at 9 in. spacing giving a 3 ft. cut, and the FE 35 model could pull a total of nine tynes in two banks of five and four giving a six-foot cut at 9 in. spacing.

TIME OF RENOVATION

The most suitable time to carry out renovation is during March-April-May. A heavy mat of kikuyu can be effectively handled if the area is burnt first in late summer, or very closely grazed in autumn, following early rains, and after its growth has been retarded by the first frosts. Without removal of some top growth it is difficult to renovate at sufficient depth to satisfactorily aerate the underlying soil.

The introduction into the sward of clover and grass seeds is best carried out at this time in conjunction with the annual fertilizer top dressing.

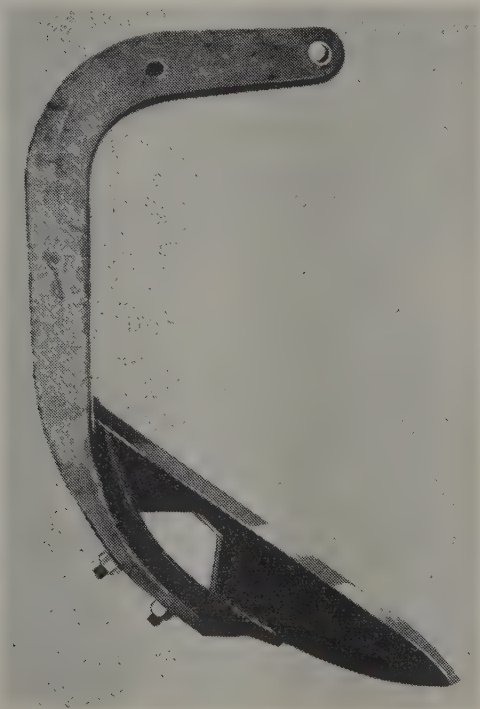


Fig. 2

OBSERVATIONS

The effectiveness of the renovation has been observed on paddocks which were treated during the autumn of 1958 and apart from an increase in vigour in the

kikuyu a marked advantage has been seen in the increase in the proportion of other species of grasses and clovers (without reseeded) which are able to grow in association with the kikuyu. The most important of these is subterranean clover which forms a very valuable association until the mat of grass becomes too dense.

The use of these points seems to offer an excellent means of sowing clover and ryegrass seeds into the sward in such a way that they have a chance of survival, as sowing direct on to a dense mat of kikuyu is completely ineffective. A seed and fertilizer attachment to the implement would increase its usefulness considerably in this respect.

The Department has always advocated that maximum productivity could only be obtained from a kikuyu or paspalum pasture so long as the sward is prevented from becoming dense, root-bound and spongy. In order to prevent this condition it is necessary to commence renovation at an early stage, and it should be continued as often as is necessary to ensure aeration of the underlying soil, and to keep the sward open. These points seem to offer the best method to date of carrying out this work.

Acknowledgement is made of the information freely given by Mr. T. George who developed these points and for assistance given by the Witchcliffe-Forest Grove Pasture Improvement Group during early trials and discussions.

The following farmers also assisted with information regarding results obtained after renovation with these points under various conditions:— Mr. E. Noakes (Witchcliffe), Mr. E. Blain (Witchcliffe), Mr. R. Gale (Warner Glen).

FREE SERVICE TO FARMERS

Do you know that the Department of Agriculture provides a comprehensive service of advice and technical assistance to farmers, free of charge?

When in need of advice, get in touch with your District Officer whose name and headquarters township will be found in the list of Departmental personnel on Pages 258 and 259.

These officers are there to help you and will make personal visits to your property to assist with on-the-spot advice. In addition, they will, where necessary, arrange for the services of specialist officers—all without cost to you.

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THE SPRAY-THINNING OF NEWCASTLE APRICOTS

By J. CRIPPS, B.Sc. (Hort.), Adviser, Horticultural Division

THE spray-thinning of fruit trees is a difficult technique to master. Moreover, local climatic conditions increase the difficulties involved, for our warm winters tend to lead to delayed foliation which in turn means that fruit tree blossoms open over a long period and that individual trees of the same variety blossom at slightly different times.

This applies to Newcastle apricots, but provided that the grower is prepared, if necessary, to spray some of his trees on a certain day and the remainder at a later date, spray-thinning can be carried out.

The number of spray applications necessary to treat all the trees in a particular planting varies with winter temperatures. After a cold winter, when all the trees flower within two or three days, one application would be sufficient but when blossoming is spread over ten days following a warm winter, three applications may be necessary. It must be emphasised that if Newcastle apricots are to be thinned the spray must be applied when two-thirds of the blossoms are open or within two days of that date. If this is not done the effectiveness of the spray is reduced.

Having outlined the difficulties let us look on the bright side. Firstly spraying is cheap. The total cost including the spray, the labour utilised and the wear and tear on equipment is slightly less than three shillings per tree, but hand thinning may cost 21s. Furthermore spray-thinning as opposed to hand-thinning leads to a slight increase in fruit size, for the excess fruit is removed several weeks earlier.

The material used is the sodium salt of DNC dissolved in water and sold as Dinoc, a weedkiller. This material contains 35 to

36 per cent. of DNC which is only partially in solution and one pint of Dinoc should be added to nine pints of water to make ten pints of solution containing 3.5 to 3.6 per cent. of Dinoc. Six pints of this solution should be added to 100 gallons of water to make the very dilute spray required containing only 265 parts per million of NaDNC. The winter spray of DNC dissolved in oil is useless for spray-thinning.

The trees must be sprayed very thoroughly, up to four gallons of spray per tree being used, and spraying is a dirty job since DNC is a wool dye and stains the skin. Protective clothing should therefore be worn.

Spray-thinning does not necessarily completely eliminate hand-thinning and it may be necessary to hand-thin clusters of fruit which have not been sufficiently thinned by the spray. The amount of hand-thinning required will however be very small unless the trees set an exceptionally heavy crop.

It is suggested that growers who wish to follow the recommendations of this article spray-thin only half their trees and compare them with their unsprayed trees and that they contact their local adviser or instructor so that they may receive all possible assistance and advice.





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DISEASES *of* GOATS

ENTEROTOXAEMIA

By J. SHILKIN, B.V.Sc., Assistant Chief Veterinary Surgeon

EENTEROTOXAEMIA is mainly an acute infectious disease caused by the organism *Clostridium welchii*, Type D, which is also responsible for enterotoxaemia or "pulpy kidney" in sheep. The organisms are normal inhabitants of the small intestine, but under favourable conditions they may produce a powerful toxin. The subsequent absorption of this toxin through the bowel wall generally produces a fatal toxæmia.

Goats of all ages may be affected, but it is probably more common in those over six months old, and animals in good condition are the most susceptible.

Alteration of the physical state of the bowels, such as may occur with a sudden change of feed, or when plentiful supplies of lush feed enable the animals to eat their fill without taking adequate exercise often results in the occurrence of the disease.

SYMPTOMS

There are two well-defined forms—acute and sub-acute and possibly a third, a chronic form.

In the **acute form**, the most noticeable symptoms are a sudden loss of appetite, severe watery diarrhoea which may be blood-stained, marked abdominal pain, violent movements and screams of pain

followed by coma and death. The temperature may be high and the respiration accelerated and death usually occurs within several hours, or up to 36 hours after the appearance of symptoms.

In milking animals, there is a sudden drop in milk production at the milking prior to the onset of symptoms.



The **subacute form** is characterised by a loss of appetite and softening of the droppings which rapidly become diarrhoeic, and may contain some blood. The animal is dull and listless, but the severe abdominal pain seen in the acute form is absent. There is, in this form too, a sudden drop in production in milking animals and the symptoms may persist for several days before death occurs.

There is some doubt about a chronic form, but there have been reports of a condition in which anaemia and wasting occurred over a period of months and which was attributed to *C. welchii* infection.

POST-MORTEM SYMPTOMS

As with sheep, post-mortem findings are not very evident, particularly if the examination is carried out soon after death, but small haemorrhages of the heart muscle and sac and inflammation of the fourth stomach and small intestine are usually present.

dosage is high and subsequent doses maintained at proper intervals for a sufficient length of time. For this purpose, 2 grammes (4 tablets) for each 20 lb. weight given as the initial dose followed by 1 gramme (2 tablets) for each 20 lb. weight at 12 hourly intervals until the diarrhoea ceases, would be a suitable dose rate.

Pulpy Kidney Antitoxin may also be used for treatment, and for this purpose the injection should be carried out as early as possible. At least 20 ccs. should be injected but up to 100 ccs. may be used if thought necessary.

The combination of sulphamezathine and antitoxin treatment is likely to be more successful than either alone, but as will be mentioned later, the use of antitoxin has some dangers, particularly with the Saanen breed.

PREVENTION

As it seems that a sudden change to succulent feed is an important factor in "triggering off" the infection, every care



Saanen goats in particular are often adversely affected by injections of Pulpy Kidney vaccine as prepared for sheep. Specially prepared goat vaccine should always be used

DIAGNOSIS

A presumptive diagnosis, particularly of the acute form, can usually be made on the symptoms, but an accurate diagnosis requires laboratory examination of small bowel contents or faeces.

TREATMENT

Treatment with sulphamezathine by mouth may be effective provided the initial

should be taken to accustom the animals to new fodder gradually.

When cases occur, it may be possible to protect the remainder with antitoxin which confers immunity for two or three weeks. However, antitoxin is comparatively expensive, and as there are some special dangers in the use of antitoxin, it is probable that preventive vaccination designed to maintain a high level

of immunity throughout the year is the more practical procedure. This is particularly important in goats in which the seasonal incidence seen in sheep does not necessarily occur.

For this purpose a special vaccine for goats has been prepared by the Commonwealth Serum Laboratories, and this is given by subcutaneous injection in a dose of 1 cc. followed successively at intervals of one week, by doses of 2 ccs., 3 ccs., and 4 ccs. A further dose, also at an interval of one week may be given with advantage.

In order to maintain the level of immunity, re-vaccination at intervals of approximately six months is advisable.

In the case of the white Saanen breed particularly, there appears to be an idiosyncrasy to the injection of Pulpy Kidney sera and vaccines—and possibly other vaccines—and collapse, abortion and deaths are possible if care is not taken. This condition is known as anaphylatic shock and may occur where an animal is first sensitised with a foreign protein and then injected ten or more days later with

further amounts of the protein. For this reason, the special vaccine for goats has been prepared in such a manner that the foreign protein it contains has been reduced to a minimum and vaccination is carried out with small doses at intervals of one week. It is important to remember that these intervals should not exceed one week.



“MOORA” WHEAT

No Pedigree Seed This Season

Early last year the wheat variety “Moora” bred by the W.A. Department of Agriculture was released for distribution to farmers. A mid-season variety with high flour strength it was considered to be a suitable replacement for the varieties Bencubbin and Bencubbin 48.

In tests conducted by the Department, “Moora” out-yielded both these varieties and proved superior to Bencubbin 48 in straw strength and disease resistance. It is resistant to flag smut and all known Australian races of stem rust. In addition it has other desirable agronomic characters including the absence of shedding.

The Director of Agriculture (Mr. G. K. Baron Hay) when discussing the performance of “Moora” during the past season stated that it had generally fulfilled expectations in comparison with the two Bencubbins.

Last season the bushel weight of many deliveries of a number of varieties was below average owing to the influence of the long season and late rains near maturity.

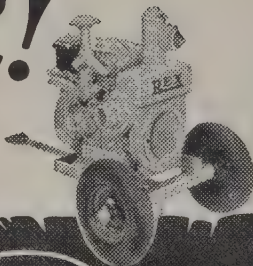
Bencubbin 48 under these conditions showed a bushel weight lower than many of the other varieties but was superior to “Moora.” The bushel weight of “Moora” was, in many instances such that it might have been subject to dockage on this account but in a more average season this variety could give a satisfactory bushel weight figure.

Generally, it is considered that “Moora” has proved superior to Bencubbin in the aspects of grain yield production, flour quality, disease resistance and other agronomic features and in spite of the low bushel weight in the 1958/59 season, is still a desirable midseason variety for planting under our conditions.

However, the Department is not losing sight of the importance of bushel weight in relation to “Moora” and this will again be closely examined at the end of the coming season. On this account it is considered that pending further information it would be unwise to encourage the expansion of the growing of “Moora” and it has been decided to withhold the distribution of pedigree seed from research stations to farmers for this year, pending this enquiry.

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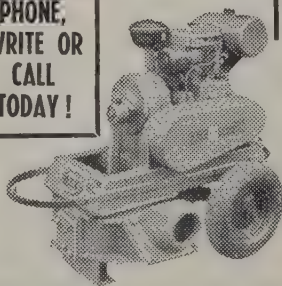


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Fig. 1.—Seven-year-old windbreak of *Pinus pinaster* at the Esperance Research Station (19 inch rainfall).

Tree Establishment on Esperance Plains

By G. E. BROCKWAY, B.Sc. (Adel.), Superintendent of Research, Arboriculture and Interior, Forests Department

SOME three miles north of Esperance, the land rises sharply to an extensive undulating peneplain of heath land, of about 500 feet elevation, some 30 miles wide and extending for many miles to the east and west. Except for limited areas of paperbark (*Melaleuca* sp.) and yate (*Euc. occidentalis*) in the swamps and scattered marlock (*Euc. tetragona*), chittick (*Lambertia* sp.) and Christmas tree (*Nuytsia floribunda*) on the higher ground, little of this vegetation exceeds two feet in height. Much of it is capable of attaining somewhat greater stature, but has been prevented by frequent bushfires.

The soils of the area are of low fertility, and consist of heavy clay overlain by sands or laterites, or combinations of both, of varying depth. Roots of the natural vegetation are confined almost wholly to the surface soils and do not penetrate the clay to any extent. The depth of the soil above the clay is consequently of importance when considering tree establishment.

Although this land appeared agriculturally unattractive, some settlement had taken place over many years in the wetter

portions of the region—mainly within 25 miles of Esperance itself. On some of these older properties, occasional groves or lines of trees dot the skyline, showing where man has successfully established trees, where nature provided none. One would expect with its mild climate and assured, although not excessive, rainfall (26 in. at the coast) that the Esperance region would support some form of tree growth, and it is fortunate that some of the pioneers of the district, such as Mr. Fred Bow, the

late Mr. A. Turner, and Mr. A. Helms, actually demonstrated the practicability of tree establishment on their properties.

Moreover, the time which has elapsed since the earlier planting took place enables us to assess in some measure the value of the various species for farm planting on a long-term basis. Points which emerge clearly are that trees must be freed from scrub competition by thorough preparatory soil cultivation, and need the assistance of artificial fertilisers.

The Esperance Pine Plantation established in 1928-29, by Esperance Pine Forests, Ltd., when little was known of the importance of the above points, provided, in the light of present day knowledge, excellent examples of what not to do.

Advantage was taken, by the Forests Department, of this plantation to establish a number of experiments, which ultimately yielded valuable information on the nutritional requirements of the Cluster Pine (*Pinus pinaster*). Armed with the knowledge and supported by information

accumulated elsewhere in the State, the Forests Department carried out further plantings of pine, during the years 1951-56. By applying a limited amount of fertiliser, employing better soil preparation techniques, and using improved strains of pine, it was found that by 1958, trees planted in 1951 had surpassed the trees in the original plantation which had battled with scrub and soil poverty since 1928.

During 1951, the Forests Department, in association with the Department of Agriculture, carried out sowings and plantings of a number of tree species at the Esperance Research Station, and these are continuing.

The rainfall here (about 19 in.) is somewhat lower than at the other areas planted.

During the last four or five years, as a result of the accelerated tempo of agricultural development in this region, the necessity for extensive tree planting has become increasingly apparent, and interest in it has increased accordingly. Results of past



Fig. 2.—View of portion of Esperance Plantation (*P. pinaster*). Foreground: 1956 planting. Left background: 1951 planting showing result of advances in strain selection and establishment technique when compared with 1928 planting central background



Fig. 3.—Shade group of Bald Island Marlock established on cleared heath land on one of the older Esperance farms.

planting indicate that some half dozen species at least, can be successfully established in the moister region of the Esperance plains, and while no doubt, this does not include the whole range of those suitable, it would be inadvisable to depart from this list, except on a small experimental basis. This list is:—

Bald Island Marlock (*Eucalyptus Lehmanni*.)

Tuart (*Euc. gomphocephala*.)

Cluster Pine (*Pinus pinaster*.)

Tasmanian Bluegum (*Euc. globulus*.)

Stone Pine (*Pinus pinea*.)

Golden Wattle (*Acacia pycnantha*.)

A number of other species have been planted, and no doubt some of these may eventually be added to the recommended list. Trees still under trial include—

Sugar Gum (including the dwarf variety-Nana). (*Euc. cladocalyx*.)

Brown Mallet (*Euc. astringens*.)

Blue Mallet (*Euc. Gardneri*.)

White Mallet (*Euc. falcata*.)

False Mahogany (*Euc. botryoides*.)

Wandoo (*Euc. redunca*.)

Black Cypress Pine (*Callitris calcarata*.)

Arizona Cypress (*Cupressus Arizonica*.)

Canary Island Pine (*Pinus canariensis*.)

In tree establishment, a number of points must be considered—

- (1) How can trees be established, and at what cost—whether by planting or sowing (sowing is cheaper) or whether balled nursery stock or open-rooted plants would be used?
- (2) Purpose for which required—whether for windbreak, shelter belt, shade group, isolated shade trees, ornamentals, or timber and woodlot.
- (3) The susceptibility of the various species to damage or destruction by stock, vermin, or fire.

Briefly it may be stated that the Eucalypts must be established by the use of balled stock, i.e., plants raised in individual containers or in some cases by use of plants raised in trays.

The cost of production of these trees is in the vicinity of 2s. each to which must be added the freight charges from nurseries in the western portion of the State. Allowing for possible loss in transport and planting losses, planting with balled stock on an extensive scale can be

an expensive undertaking on the score of planting stock alone. The constant nursery attention required by plants raised in this manner necessitates an output of about 20,000 plants per year, to make their production at this price an economic proposition.

Most pine species can be produced at a much cheaper rate in nursery lines and transplanted open-rooted.

A brief description of the various species, and their possibilities follows:—

Bald Island Marlock.—This is a tree of the south coast and some of the islands of the Recherche Archipelago, and is naturally suited to the climate. It is one of the best of eucalypts, for either shade, low windbreak, or shelter belt. For very many years, the trees, if given ample growing space, retain their crowns, almost to the ground, and if planted in a single line, provide good low shelter and wind protec-

tion. As they age, they may attain heights of 15 to 30 ft. or more, and develop spreading umbrella-shaped, shady crowns. This is a particularly hardy, attractive and useful tree for the district. Plants are available in season from Dryandra or Hamel Nurseries.

Tuart.—This is a well known tree from the west coast of W.A., and where soils are reasonably deep, it does well in the Esperance district. It is a rapid grower when conditions suit it. As it ages, it tends to carry its crown upwards, and offers very little wind protection close to the ground. If required as a shelter belt, it would be as well to plant a row of tuarts parallel to a row of shorter-growing trees, such as golden wattle.

Plants available from Hamel Nursery.

Tasmanian Blue Gum.—Trees planted by Mr. Fred Bow on his property thrived well, but results at the Esperance Research



Fig. 4.—A range of Eucalypt species under trial in the arboretum at Esperance Research Station—1951 planting. With extensive agricultural development on the treeless Esperance plains, are associated problems involving the provision of shade and shelter from wind.



Fig. 5.—Lines of seven-year-old Bald Island Marlocks at the Esperance Research Station.

Station where the rainfall is somewhat lower; and the soils shallow, have been less spectacular. Its tendency to form a long trunk and small crown renders it rather ineffective either as a shelter belt or for shade purposes.

Trees available from Hamel Nursery.

Cluster Pine.—This tree has proved itself eminently suitable for the Esperance district, but it needs good soil preparation, superphosphate, and zinc, and protection from rabbits and stock. It is a dual-purpose tree, providing not only shade and wind protection, but also a useful timber. With softwood species, even very small trees can be utilised, for timber production. The timber is useful in smaller sizes, for case-making and in larger sizes for flooring, linings, etc. Pine has the advantage of easy and cheap propagation. It can be raised in nursery lines which do not require the constant attention needed for balled stock and can be transplanted to the field as open-rooted plants. It is drought-resistant and belts of half a dozen rows, or even blocks of an acre or more, at about 10 ft. x 10 ft. spacing will provide shade, shelter and timber. With suitable preservative treatment, pine fence posts have proved quite durable. It is anticipated that a limited number of

Cluster Pine seedlings will be available from the local Agricultural Research Station for the 1959 season.

Stone Pine.—In its native land (Italy), this tree is grown primarily for its nuts which are used for culinary purposes. As a timber producer, it is very poor. However, the large spreading crown makes it an extremely attractive shade tree, and isolated specimens of it could ultimately prove both useful and picturesque on Esperance farms. A line of these trees can be seen in the old Forests Department paddock near the Norseman Road, some 11 miles from Esperance. These have competed with scrub and fire, and look rather poor. The specimen on the northern end of the row received a couple of pounds of superphosphate, three or four years ago, and the response is obvious. With fertiliser application and freedom from competition this should be a worthwhile species.

Golden Wattle.—The wattles are comparatively short-lived trees and do not attain great size, but their attractive appearance and rapid growth make them very desirable subjects to provide quick shade and a quick return, while the slower-growing species are becoming established. Besides their usefulness in providing shade and shelter, the bark of these trees is a

valuable tanning material. Specimens raised from seed sown by Mr. A. Helms, some 30 years ago, can still be seen in the "Forestry paddock" mentioned earlier.



Fig. 6.—Seven-year-old Golden Wattles at the Esperance Research Station.

What are more interesting, however, are the numerous trees of younger age, which have become established naturally from seed from these originals. This demonstrates not only the species' ability to regenerate naturally, but also its non-palatability to rabbits, which enables it to persist when other trees are eaten out.

Perhaps the most attractive aspect of wattle growing is the cheapness of its establishment. This can be done by direct sowing in the early winter. The area or strip to be sown should be well cultivated, preferably twice, with a 12 months' interval between working. Seed, treated with hot water, should be spot-sown in a line, or lines, at about 8 ft. intervals. The seed treatment, as employed by different authorities varies slightly, but I have found it

quite effective to boil up some water, remove it from the fire for half a minute or so, and then pour it on the seed in a cup or tin, allow to cool, and sow the seed. It is probably inadvisable to treat more seed than can be sown on the same day. Each sowing spot should be hand cultivated to a diameter of about a foot, with a small hand hoe, to a fine tilth and a few seeds dropped into it. These should be covered by about $\frac{1}{4}$ in. of soil, which should be pressed lightly to firm it. A further light layer of loose soil is sometimes kicked over this. The addition of a small quantity of soil from near existing wattle may assist in ensuring soil inoculation. It is anticipated that some seed will be available from the Esperance Research Station, but settlers desiring to carry out large-scale wattle establishment would be advised to collect their own seed locally, during the early summer. Seed pods are picked as they dry, and put in a bag which should be rolled and generally kicked about to separate the seed from the pod.

For those who require only a limited number of golden wattles, balled plants are available at current rates from Hamel Nursery.

While it is as yet too early to make recommendations regarding other trees, the development of such species as Blue Mallet, Brown Mallet, inland Wandoo, dwarf Sugar Gum, Canary Island pine, and some of the *Callitris* or native pines, will be watched with considerable interest, particularly for use on the drier sections of the Esperance plain. One must expect with the rapid falling off in rainfall as one proceeds northwards, that a range of species wider than that given in this article, will be needed to ensure successful tree establishment over all sections of the Esperance plain.





CREAM STIRRING IS IMPORTANT

By D. C. MICKLE, Dairy Instructor.

WE all know that there are a thousand and one things to bear in mind in the production of satisfactory cream such as good stock water, clean pastures free from rank weeds, healthy cows, clean milking and clean milking machines, protection from heat, frequent deliveries, clean, bright cream cans etc.

All these things have a bearing on the ultimate quality of the cream and each is of vital importance if the best quality is to be produced. But one of the most neglected jobs in cream production is the systematic stirring required. One has only to examine the cans of cream as received at any of our butter factories to know that cream stirring **just does not occur** on many dairy farms.

When the factory operative dips his stirrer in the cream and gives it the first turn-over, it is apparent, in many cases, that that is the first stir the cream has had. How do we know? Simply because the thicker, older cream of higher acidity shows as lumps and, in many cases, white curd, as result of that acid, is brought up from where it has developed in the bottom of the can.

A well-stirred cream has a smooth glossy texture—it has an “alive” appearance. This is the result of even ripening, or acid development, in the cream. Well-stirred cream two or three, or even four days old, providing it has been properly cooled and cleanly produced, can give the buttermaker the opportunity of producing a butter with full flavour character. There is no reason why cream stirring should

be an onerous task at the dairy. A gentle stirring three times daily, or at least twice daily, is required. Stirring should be done with a well-tinned or stainless steel stirrer made to a pattern of solid handle and rod attached to an inverted dish-shaped plate in which three or four holes of about one inch diameter are placed equidistant one to the other. Stainless steel is recommended because then the stirrer can be left standing in the cream without ill effect. The same, of course, applies to the use of a tinned steel stirrer but this type tends towards rusty surfaces when the tinning wears through. Do not on any account use a stirrer of hollow handle type, for cracked seams or pin holes can lead to cream putrefying inside the handle and causing contamination each time it is used.

The days of using a wooden stick with which to stir cream are long past. Such type of stirrer cannot be properly cleaned and when in such condition, contaminates each lot of cream as it is stirred. The same applies to any wooden spoon. Metal spoons are also unsuitable being too short in length and do not allow for the very necessary action of bringing the bottom cream up to the top.

The method of stirring is simply to **gently** turn over the cream in the can, bringing the bottom up to the top and vice versa. Half a dozen stirs with an up-and-down and rotary motion is sufficient at any one time and can be carried out when mixing the new cream with the old. On no account, of course, allow hot cream to be mixed with cold cream, for this is the start towards second-grade cream. Rattling the stirrer around rapidly with circular motion in the cream only succeeds in wearing out the tin on the can and the stirrer. Care must be taken, however, not to over stir for such will cause partial churning of the cream with uneven distribution of the fat.

Those of you who fill a can of cream or more at each milking may think that there is, therefore, no reason, for you to stir your cream. Yes, there is. Stirring gives even acid development, plus aeration which helps dispel feedy odours and flavours.

It gives (and this is important to you) an even-textured cream which permits the factory operative to obtain a proper sample.

So I am sure you will agree that proper stirring of cream is not only in your interests but is a help towards better quality butter.

I recommend you ask your factory manager to send out a cream stirrer **now**. He will be happy to do so.

CROSSBREEDING IN PIG PRODUCTION

By P. BECK, Field Assistant, Dairying Division.

PIG raising today is an enterprise where the quality product usually demands a premium in returns and to those who have studied the subject, hybridising, or planned crossbreeding, illuminates two likely advantages. One of these is the possibility of producing requirements in carcass quality to suit a particular market demand and the other is to produce pigs to obtain the benefit of what is known as hybrid vigour.

Further to the first-mentioned possibility of crossing two breeds to provide certain carcass requirements, the cross may be carried a step further by using a purebred boar of the same breed as the one of the original parents of the hybrid sow. An example of this is crossing the Large White and Berkshire to get the hybrid sow then mating the hybrid back to either the Large White boar for bacon purposes or the Berkshire boar for porkers. The progeny of the hybrid sow in such instances as this, however, are a second cross and do not have hybrid vigour to the same extent as the first cross. To overcome this and insure the crossbred advantages in the breeding sow and her progeny, it may be desirable to introduce a third breed of boar.

A very important point arising, is that if hybrid stock are to benefit the pig industry, the parent stock used for hybridising must be the result of a high standard of pure breeding. This is essential to insure good hybrid vigour in the breeding female for improved conception rate and higher fecundity with heavier weaning weights,

and in the meat pig, for such characteristics as improved feed conversion rates, higher weight for age ratio, improved liveability and greater resistance to disease.

Another method of hybridising is that which is popular in the United States. This method is sometimes known as cyclic breeding and it appears that three breeds of boars are used, each in rotation on the progeny of his predecessor.

However there still remains room for investigation into which procedure of hybridising it is best to adopt. For instance, even with a two-breed cross there is the question of which breed should provide the male and which one the female. Genetically there appears no reason why the male of one breed used on the female of another should give better results than the reverse cross, but in practice this may occur.

With a three-breed policy for meat production however, it would appear that the most logical procedure would be firstly to use two breeds superior for fecundity and

maternal characteristics to reflect these in the hybrid sow and finally to use a boar of the required carcass type on the cross, to obtain the desired result.

Crossbreeding of course cannot take precedence over pure breeding but there is room for good crossbred stock and especially where the environment is hard, the hybrid types withstand the conditions better in many cases, than purebred animals.

With the advent of the Landrace into Western Australia, selective crossbreeding of this breed with our own established breeds could form an important part of

our pig-raising industry. It is possible that the crossbreds will do well in our very hot areas, where the white skinned Landrace may be prone to sunburn. The Landrace crossed with our own breeds, may give us hybrid sows which can produce hardier, higher weight-for-age market pigs of good length, less fat and a greater percentage of the meat in the higher-priced cuts, which is most important.

Crossbreeding in the past has been an important feature in our pig-raising industry and I feel sure that the future may see it playing a bigger part in the production of pigmeat.

SALMONELLA INFECTION IN SHEEP

By I. J. MILLER, Veterinary Surgeon, Animal Health and Nutrition Laboratory.

SALMONELLOSIS, or paratyphoid as it is often called, is an highly infectious disease caused by bacteria known as salmonella. These bacteria invade the intestinal tract and subsequently gain access to the blood stream.

The source of infection is at times difficult to trace. Recovered sheep from previous outbreaks are commonly responsible. These may remain "carriers," continuing to harbour the salmonella organisms in the bowel and to excrete them in their droppings.

Salmonellosis, however, is not confined to sheep but affects many species of animals which may also act as carriers. Therefore, cross-infection from other animals cannot be ignored, i.e. outbreaks in sheep have been attributed to birds excreting into water tanks etc. Animal products such as meatmeal are another possibility which should be borne in mind.

Outbreaks of this disease usually coincide with the dry conditions of summer and autumn, where congregation of sheep around the limited water supplies and stagnant soaks, may lead to contamination of the water by droppings from carriers.

Other factors which may be responsible for initiating outbreaks are—stress imposed during transportation over long distances; prolonged yarding at abattoirs with access to troughs contaminated by previous sheep,

and mustering together with inadequate feed and water facilities.

The early signs of an outbreak are usually a few sudden deaths and a high percentage of sheep showing symptoms. Such sheep will show scouring, at times blood-stained; trembling, depression, unsteady gait and prostration. In some showing symptoms death may occur rapidly, while in others it may be delayed for several days.

Losses may assume the proportion of 20% in very severe cases, although in recent outbreaks reported in South Australia, mortalities rarely exceed 3%. Even when the death rate is not high, a majority of the sheep in affected flocks may show signs of the disease with a resultant loss of condition. Of recent outbreaks in Western Australia, the most serious was one occurring in a flock of ram weaners. Scouring was the prominent symptom and total losses amounted to approximately 10%. A similar outbreak from the same property last year resulted in 12% deaths. Sheep of any age may be affected but many of the outbreaks investigated here have been in the weaner flocks.

On post-mortem examination the most significant feature is congestion and reddening of the intestinal lining. Confirmatory tests are carried out at the Animal Health and Nutrition Laboratory, and in suspected outbreaks it is advisable to contact either the Department of Agriculture or a local veterinary practitioner.

The treatment of affected sheep is of limited value. In the early stages the injection of Sulphamezathine Solution (33½%) under the skin at the rate of 3 c.c. for each 15 lb. of body weight has shown quite good results. On a large scale, however, this is often impossible.

In view of the limited possibilities of treatment, preventive measures should be aimed at, as wise husbandry will play a large part in controlling this disease.

The main points to consider in prevention are:—

1. Ensure adequate supplies of clean water, and clean the troughs regularly.
2. Avoid sudden feed changes.
3. When feeding grain as a supplementary ration, ensure that distribution areas are clean and these sites changed frequently.
4. Handle sheep as little as possible.
5. When transporting sheep any distance, ensure adequate resting points, taking precaution against the use of previously contaminated troughs in stock yards.
6. Where possible cover all tanks to avoid outside contamination.

If the above steps are borne in mind during the susceptible period, outbreaks of salmonellosis will be reduced to a minimum.

USEFUL SPRAYS IN THE HOME GARDEN

By A. A. HOLLAND, Plant Pathologist.

SINCE 1939 there has been a great increase in the number and chemical complexity of fungicidal materials coming on to the market. This is partially due to the efforts of the petro-chemical industries to find uses for their by-products. The home gardener is apt to be confused and dismayed at the wide array of compounds with different trade names that are displayed guaranteed to cure his various garden problems.

In my own garden with the two simple compounds of copper or bluestone and sulphur and perhaps two of the newer fungicides thiram and ziram I have been able to deal with the bulk of the problems that arise in my flower, vegetable and small fruit patch from time to time during each season.

The most effective of the copper sprays for general purposes is Bordeaux Mixture. This spray, accidentally discovered in the French province of Bordeaux in 1885, can easily be made up at home. Bordeaux mixture simply consists of bluestone dissolved in water mixed with freshly-slaked quicklime in water. The gardener can make up bottles of each solution and store them for long periods provided they are not mixed together. Once the bluestone solution and lime water are mixed the spray must be used at once as the mixture deteriorates rapidly. Should the gardener

feel the preparation is too messy, commercial preparations are available such as copper oxychloride ready for mixing and use at a moment's notice. These sprays are good but not quite as good as freshly prepared Bordeaux mixture.

Bordeaux mixture covers a wide range of diseases; the leaf spots and blights on many vegetables, shot-hole, leaf curl and rusts on stone fruits and leaf spots in the flower garden such as black spot on roses.

The second general-purpose spray is sulphur, which can be applied as a dust or as a spray using one of the easily obtainable wettable sulphur dusts. The sulphurs combat the troublesome and persistent powdery and downy mildews. The mildews effect a wide range of plants such as grapes, peas, onions, roses, cucumbers, rockmelons and many garden exotics. Sulphur may be combined with slaked lime to give a lime-sulphur spray, which is often more effective than the straight sulphur.

The third group thiram and ziram type sprays will be found to be fairly effective on certain diseases such as leaf curl of stone fruits where the autumn Bordeaux spray was neglected, black spot of loquats (a common disease on metropolitan backyard trees) and rusts of snapdragons and hollyhocks.

So, with two, or at the most, four sprays, you'll find you've got a reasonable protection from most diseases. Now a word about the spraying. It's not a bit of use going to all the trouble of making up a spray then putting it in the fly spray and shooting a fine mist in the general direction of the plant.

To be effective the spray must come into contact with the worm causing the trouble.

Pick a time when the wind has dropped—use a good spray gun—and spray the plant from top to bottom until the leaves are damp above and below. For a good cover on hairy or waxy plants a spreader is usually incorporated. This is simply a wetting agent and at a pinch a household detergent would be satisfactory.

One spray application is usually not enough—use a follow-up spray in about two weeks and another in say about three weeks. Remember also, to keep the sprinklers off until the spray has had time to work.

A prompt spray as soon as your plants look diseased checks the onslaught quickly and helps to provide a satisfactory crop.

TAPEWORMS OF DOGS AND CATS

By P. B. LEWIS, Government Veterinary Surgeon.

DOGS and cats, like most other animals can become infested with tapeworms and, where the infestation is heavy, digestive troubles, abdominal pain, nervousness and unthriftiness may occur in addition to local irritation which causes the animals to drag themselves along the ground in a sitting position.

It is not generally realised that—because of their exceedingly complicated life-cycles—the tapeworms which may be present in the intestines of dogs and cats can be a menace to many other animals and even to human beings.

There are many different varieties of tapeworms varying considerably in their size and life-cycles. Those found in the larger animals may be several feet in length—those affecting dogs and cats range from about 16 inches to less than a quarter of an inch.

The adult tapeworm has a head and a flat body divided into segments and these segments progressively develop until they become what are virtually bags containing large numbers of tiny eggs. At this stage, the segments break off and are passed out in the droppings.

The eggs are highly resistant to wet or dry conditions and can be blown about in dust or distributed in water supplies.

Many contaminate pastures and are eaten by sheep, cattle and pigs in which the eggs hatch and develop into bladder-

like cystic growths usually in the lungs, heart, liver and intestines. If these animals are slaughtered and the portions of the carcass containing the cysts are eaten by dogs or cats, the cysts develop into tapeworms and the cycle recommences.

Cooking destroys the cysts and breaks the cycle.

One of the small tapeworms of the dog—a worm which is only about a quarter of an inch in length—is responsible for the hydatid cysts which are a serious menace to human health and also affect other animals. A dog or cat may carry tapeworm eggs in dust on its coat and children who put their fingers in their mouths after handling the animals could become intermediate hosts and develop hydatid cysts which usually occur in the liver or lungs.

Another common tapeworm of dogs and cats passes its intermediate stage in the bodies of fleas and lice which infest the animals. If these parasites are swallowed by dogs or cats when biting to allay the

irritation caused by the fleas and lice, the life-cycle is completed and more tapeworm eggs are released by the adult worms.

The Slender-necked Bladder-worm, a very common parasite of sheep in Western Australia is the intermediate stage of another tapeworm of the dog. Yet another dog tapeworm passes its intermediate stage as a cyst in the body of a rabbit.

To guard against tapeworm diseases of animals or humans, dogs should be dosed regularly with an efficient anti-tapeworm

drug such as arecoline hydrobromide. After dosing, the dog should be tied up and all droppings burnt.

People, especially children, should always wash their hands thoroughly after handling dogs and cats.

Dogs and cats should never be fed on uncooked offal or allowed access, to slaughter-yards where they could pick up living cysts. Boiling for ten minutes will kill the cysts.

THE POISON PLANT AND THE ANIMAL

By R. D. ROYCE, Acting Government Botanist

ON many occasions, farmers have asked the question "How much poisonous plant material is required to kill an animal?" Unfortunately the answer is a very complicated one, and depends on a number of circumstances revolving about the plant, and the animal. The actual amount, subject to these factors, can vary from a few ounces to many pounds.

Undoubtedly the most important plant factor is the actual species involved. For example, Pituri is far more toxic than Bullock Poison, and less would be required to produce lethal effect. Species which are widely distributed, show variation to a greater or lesser extent and Prickly Poison is a plant which exhibits this variability of form associated with variation in toxicity. It occurs in no less than six distinct forms, one of which is almost harmless, while two are as toxic as any of our poisonous plants. Other species e.g. Blind Grass, show little variety in actual form over their whole range but show great variation in toxicity. It is possible that this variability, at least in part, is due to differences in both soil and climatic conditions.

Stock losses tend to be seasonal, because the toxicity of the majority of poisonous plants is itself seasonal. This is particularly true of the better known pea-flowered poisons of the two genera *Gastrolobium* and *Oxylobium*. These plants are at their lowest toxic ebb during the late summer and autumn, but with the advent of winter rains there is a gradual build-up of toxicity as the young shoots elongate. The appearance of the flower buds heralds a greatly increased rate of accumulation of

the toxic principle until its peak during the flowering and seeding stages. With the shedding of the seeds, toxicity again decreases to the normal summer level. Seedling growth of most of these plants is about equal in toxicity to that of the pre-flowering mature plant.

The quantity of plant material necessary to produce a toxic plant effect is further complicated by seasonal conditions, the portion of the plant eaten (leaves, fruit, seeds etc.), and the condition of the material at the time it is ingested.

The animal factors affecting the question under discussion are properly the province of the veterinary surgeon, but a few of the more important factors are worth mentioning. The most important is the condition of the animal, and it is obvious that weak animals will not be able to withstand toxic substances as well as animals in forward condition.

When stock are hungry, due either to grazing on fallow or poor pasture or as a result of travelling, they eat rapidly when fodder is available and if any of the plants grazed are dangerous, the build-up of toxicity will be so rapid that the animal body would be unable to cope with it, and

relatively small amounts under these conditions could produce the same effects as larger amounts under normal conditions.

The species of animal and its age, sex and breed are of paramount importance, while under certain circumstances the

colour of its coat, its capacity for selective grazing, and its feeding habits can be of very great significance. With all these variable factors operating, it is understandable that the answer to our question for each individual case, is difficult.

SIRE SURVEYS TO PROVE BULLS

By K. NEEDHAM, Dairy Cattle Husbandry Officer.

THIS year, in Western Australia, about 16,000 cows will be bred artificially. Considering that the artificial breeding scheme in this State is now only in its second year it is apparent that the scheme has been accepted by the dairy farming community and it is anticipated that the demand for it will increase very rapidly.

With its expanding use there is a continual need to obtain replacement bulls of a very high standard. To achieve this it is necessary to institute a system of proving sires. It is not good enough to utilise bulls simply on the basis of their production backing. Whilst this method, must of necessity, be used before a sire-proving scheme has had an opportunity to operate, it must subsequently be replaced by some system which assesses the ability of the bull to transmit to his offspring the potential for high production.

Obviously the only method of doing this is to record the production performances of the bull's daughters. This, broadly, is what is referred to as a sire survey scheme.

It is proposed, in Western Australia, to introduce such a scheme which will be available both for the bulls standing at the Wokalup Artificial Breeding Centre and also on pure-bred private herds. The essential, therefore, of any such scheme is a system of heifer calf identification and it is on this aspect particularly that I wish to speak to you to-day.

In past years a method of identification of heifer calves has been available to members of grade herd recording units, but in future it is planned to provide this to all members of artificial breeding units and in addition to members of grade herd recording irrespective of whether they are members of an artificial breeding unit or not.

Broadly the method of identification has been designed to show, in one ear of the animal, the sire and the year of birth, and

in the other, the individual identification for the animal. This marking will be performed by field operators and by herd recorders, and the farmer concerned will be given a form setting out the particulars inserted in each of the ears of the calf. A copy of this information will be forwarded to the Wokalup Centre and will be filed into a coded system.

From time to time as these heifers come into production and are ultimately recorded it will then be possible to accumulate a considerable amount of information concerning the ability of any given bull to pass on his potential for high production. Thus basically this will enable us to prove him, and to determine whether or not he is a suitable sire to continue with in an artificial breeding scheme.

Two major points emerge, upon which the success of this scheme will be dependent. Firstly, the more people who elect to join a grade herd recording unit the better, as it will then be possible to have a greater number of recorded heifers available for the service. The more information which is available for any individual bull the more reliable will be the data which is obtained. Secondly, the success or failure of this scheme is obviously entirely dependent upon the cooperation of the dairy farming community. I have no doubt that this co-operation will be forthcoming and I feel sure that you will look forward with interest to the time when the first results of the survey will be available. This will, obviously take some little time but once commenced the scheme will become a continuous one.

PEAT AS A SUBSTITUTE FOR HORSE MANURE

By L. T. JONES, Senior Plant Research Officer.

HORSE manure has been used extensively in the past for market gardening on sandy country in the suburbs of Perth, and has proved very satisfactory. However, horse manure is now scarce and expensive, and it has become necessary to find suitable substitutes. Plant foods can be supplied easily and cheaply in artificial fertilisers, but in vegetable gardens, it is usually necessary to replenish the soil humus by the use of such bulky organic manures as horse manure, fowl manure, peat, etc.

In this talk, I will discuss the possible use of peat as a substitute for horse manure, for gardening on sand country. Peat is defined as a black spongy material, formed from the partially-decomposed remains of plants, which are preserved under water in marshes and swamps. We have chosen peat as the most likely substitute for horse manure, because it could be obtained in large commercial quantities close to the market gardens, and its occurrence lends itself to large scale mechanical digging. Many of the suitable peat swamps, close to Perth, will in time, be used for factory sites, and the peat could therefore be removed before such areas are filled in.

The practical importance of this talk hinges on the question, "Is it essential to use horse manure, etc., in vegetable gardening?" It is known from the results of soil-less gardening that we could grow vegetables by the continuous feeding of complete chemical fertilisers. However, practical experience has shown that to obtain high yields and first quality vegetables on sand country, it is safer, simpler and cheaper to combine the use of a bulky, organic manure, like horse manure, with the application of the more concentrated and more soluble artificial fertilisers, such as superphosphate, sulphate of ammonia and muriate of potash.

Materials like horse manure and peat play their part in intensive gardening by—

- (1) Supplying a continuous source of plant foods, which are not easily leached out by rainfall or irrigation water.
- (2) Limiting the rapid washing out of added mineral fertilisers.
- (3) Improving the physical conditions of the soil.

Recently a quantity of good quality peat was dug out of a swamp at Osborne Park and used to compare its effectiveness with horse manure on a crop of cabbages on sand country, under sprinkler irrigation. The two materials were compared on a volume basis as it was considered probable that transport and handling charges would mainly determine the cost of application. A surface layer, half an inch deep was applied, which is equivalent to 80 cubic yards to the acre. This application was found to apply, 15 tons per acre of horse manure and 55 tons per acre of moist peat.

In these first trials, it was found that while normal applications of mineral fertilisers were being applied, peat was a good substitute for horse manure, but that when the final fertiliser application, normally applied to "finish" the cabbages was omitted, horse manure was superior to peat. This indicates that horse manure is both a fertiliser and a soil improver, while peat is mainly a soil improver.

It is therefore obvious that to get the best results from peat as a soil amendment, adequate fertilisers for that particular crop must be used.

The chief value of peat, may lie in the fact that the humus it adds to the soil will be of a persistent nature, and so may confer prolonged benefits on the soil. On the other hand, horse manure would tend to "burn out" more quickly.

We feel that there could be a place for the use of peat as a soil amendment in market gardening, and probably home gardening, too. Therefore, we propose to continue our studies with peat until more definite statements can be made of its value for various crops under proper management practices.

CULL THE LOW PRODUCERS

By W. L. McGARRY, Officer-in-Charge, Sheep and Wool Section

EFFICIENT culling of maiden ewes before they join the breeding flock is an essential part of any policy of flock improvement. It is recommended when culling that paramount consideration be given to the removal of the low wool producers. Culling in this manner leads to an immediate improvement in returns and the economic advantages of such a policy are obvious.

To illustrate the point—say we take ten ewes, for convenience with fleece weights as follows:—

(This could apply equally to any number.)

	Fleece Weight.
	lb.
1	12 $\frac{1}{2}$
2	12 $\frac{1}{4}$
3	11 $\frac{3}{4}$
4	10 $\frac{3}{4}$
5	10 $\frac{3}{4}$
6	10 $\frac{1}{2}$
7	9 $\frac{1}{2}$
8	8 $\frac{3}{4}$
9	7 $\frac{3}{4}$
10	7 $\frac{1}{2}$

Total weight 102 lb.

This divided by 10 gives an average cut per head of 10.2 lb.

Suppose we cull 30 per cent. on fleece weight. This removes Nos. 8, 9, 10, leaving:

	Fleece Weight.
	lb.
1	12 $\frac{1}{2}$
2	12 $\frac{1}{4}$
3	11 $\frac{3}{4}$
4	10 $\frac{3}{4}$
5	10 $\frac{3}{4}$
6	10 $\frac{1}{2}$
7	9 $\frac{1}{2}$

Total weight 78 lb.

This divided by 7 gives an average cut per head of 11.1 lb.

This shows an improvement of 0.9 lb. or nearly 1 lb. per head in the average cut per head by removing those ewes which are **proved** low producers.

How do we obtain this proof and know that our selection is accurate? Simply by weighing the fleeces at shearing time.

It has been proved that visual selection for fleece weight is unreliable and inefficient compared with the scales which take the guesswork out of selection. Even if you could be 100 per cent. efficient in visual selection (most growers are about 30 per cent.) you would not know your selection was accurate without the proof which the scales can give.

Fleece weighing is quite practicable and presents no great difficulties provided the sheep are drafted off and shorn separately. Before shearing, the sheep should be ear-tagged with temporary numbered metal alligator ear clips—or plastic numbered ear-tags could be used.

Ordinary single-bag wheat scales placed at the end of shearing board, and a number of small cards are required. Alternatively, hanging clockface scales with fleece tray attached could be used.

PROCEDURE

As the sheep are being shorn the picker-up writes the ear-tag number on a card and leaves it on the board opposite the sheep. The fleece is picked up with the card on top, weighed, and the fleece weight is then written on the card. The fleece is then thrown out and skirted in usual manner.

When wheat-bag scales are used it will facilitate wool handling and weighing if the scales are set to the weight of the picker-up, who steps on the scales while holding the fleece.

Later, at a convenient time the wool weights and ear-tag numbers of each sheep can be entered in a notebook from the cards. (This could be done during fleece weighing if desired.)

You now **know** your low producers and they can be culled to the extent desired. Always make sure they have a permanent identification mark **before** the temporary ear clips are removed.

Where the odd doggy or cull type fleeces are encountered when the fleece is on the table, the cards can be marked accordingly. It is easier to pick an undesirable fleece in this manner than when the wool is still on the sheep.

BRUCELLOSIS IN SHEEP

Although the vaccination of rams for the control of ovine brucellosis has been recommended in New Zealand, the Chief Veterinary Officer of the Department of Agriculture (Mr. C. R. Toop) does not at present favour vaccination against this disease in Western Australia.

He points out that vaccination is not recommended in any Australian State where the disease has been studied and it has been prohibited in South Australia. He states that vaccination would delay eradication because of its effect on diagnostic tests.

One of the vaccines used is Strain 19 as used for immunisation of cattle against contagious abortion, and as it contains living organisms, which may cause disease in human beings, it is available only to veterinary surgeons.

The infection in New Zealand appears to be more virulent than the Australian type of the disease. In New Zealand, ovine brucellosis not only causes epididymitis in rams, but is responsible for impaired fertility and abortion in ewes. Ewes in Australia appear to suffer no ill-effects and carry their lambs to full term.

Ovine brucellosis was diagnosed for the first time in Western Australia about five years ago and the observations that have been made in the meantime indicate that the disease is no less prevalent here, than in other States.

Research work over the last few years in Victoria, South Australia and Queensland has provided much valuable information as to the manner in which the disease is spread, and a reliable diagnostic test has been developed.

Observations in Victoria have shown that spread of infection occurs readily from ram to ram (sexual intercourse between rams is regarded as the main method of spread), but that it can also occur where clean rams and infected rams are mated with the same flock of ewes—clean rams have been shown to readily become infected after serving ewes recently served by infected rams.

There are always a few sheep which are poor in conformation, too narrow, etc. These can be eliminated during a light culling for only these characteristics, off-shears or just prior to shearing.

Officers of the Sheep and Wool Branch, Department of Agriculture, conduct field days on farmers' properties, demonstrating the technique and shearing shed procedure of culling by fleece weight as described in these notes.

Where demonstrations are required, an application in writing should be made to the Officer in Charge, Sheep and Wool Section, Department of Agriculture, Perth, or the local district Agricultural Adviser could be contacted.

The ewe may become affected, but does not transmit the infection to the lamb, and in the course of time the ewe throws off the infection.

It has been observed that where young rams are reared together from weaning and are kept apart and mated apart from older rams, they do not become affected by the disease, even though there may be a high incidence on the property.

Field trials are now in progress in Victoria to determine whether under varying conditions of management it will be possible to rear clean young rams by this method, and if successful, it will mean that the disease can be relatively simply eradicated from infected properties without severe economic loss.

After several years of close investigation, South Australian workers have concluded that ovine brucellosis is of little importance in commercial flocks. They say that the disease has not been found to cause the losses reported in New Zealand, and that they have not been able to attribute any loss in a commercial flock to it. They consider the disease only to be of importance in studs where stud sires used for single mating prove infertile and clinically affected rams are unsaleable. They also point out that the culling of clinical cases, although it reduces the incidence of clinical epididymitis, does little to eradicate the disease.

Many rams with long-standing infections often show little pathological abnormality and cannot be detected by clinical examination. The fertility of clinical rams varies, and while many such rams are infertile a great number are fully fertile.

It is therefore considered that the eradication of the disease from stud flocks along the lines suggested above offers the best approach to the problem.

There is still much to be learned about ovine brucellosis, said Mr. Toop, and until further information becomes available, vaccination cannot be recommended as a control measure in this State.